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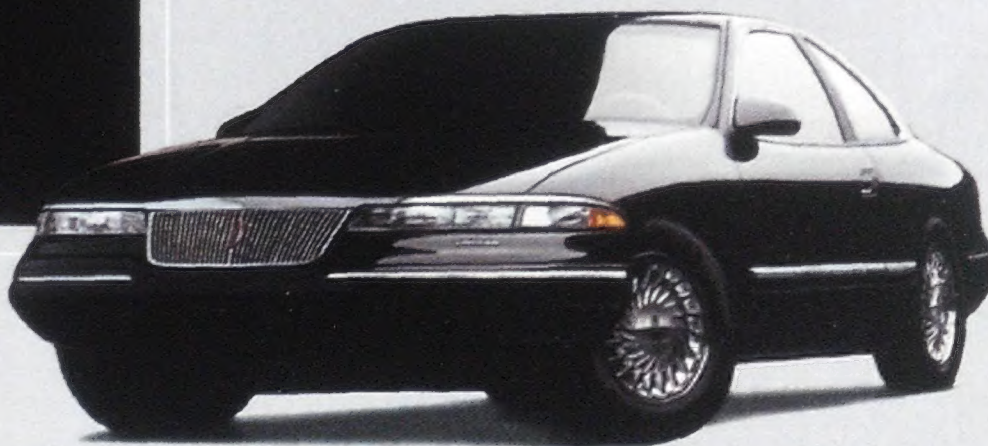
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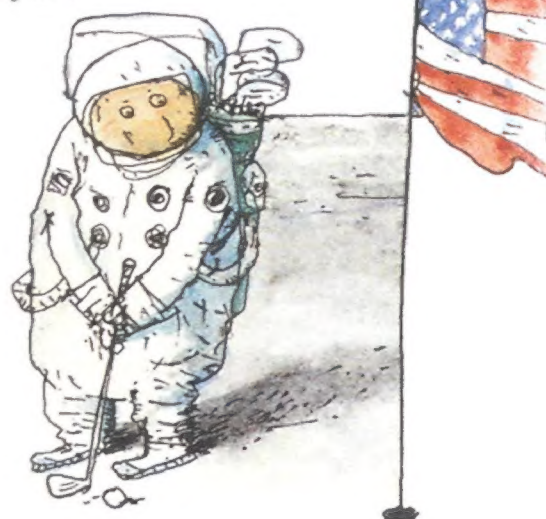
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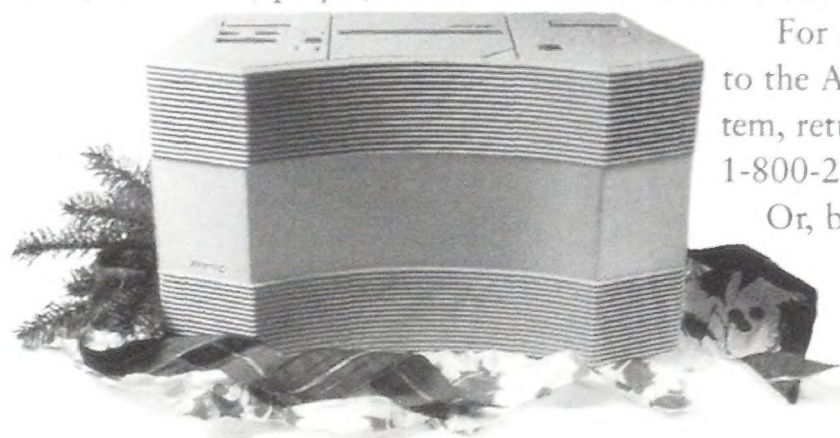
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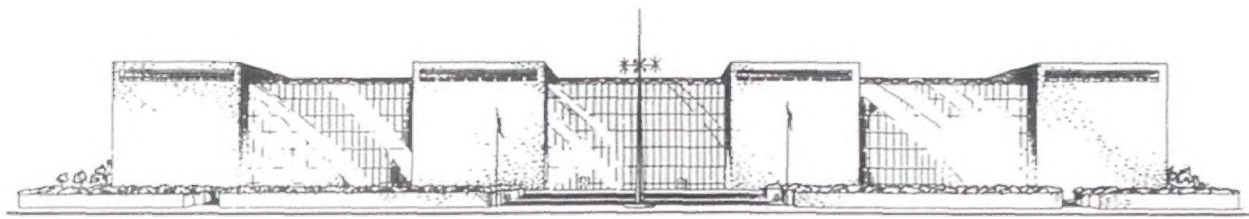
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Infogridlock?

Information highways are all the rage these days. But with the pressure for everyone in the world, from schoolchildren to Mom-and-Pop stores to major banks and industries, to sign on, how soon will those highways become gridlocked?

We already know that our phone system is not up to Mother's Day and natural disasters, though by universally replacing the older electric cables and microwave links with fiber optics, a 10,000-fold increase in capacity may be achieved. But is that enough to meet all needs? The answer will depend on how we price that service, because if it is entirely free of charge, the system is virtually bound to become overused, no matter how capable it is.

For many businesses and industries, real-time video-conferencing will be essential. They will also need to hunt through ever more up-to-date data banks for complex indicators of trends. To be readily understood, these will have to be analyzed for patterns that can be displayed in images the mind can readily absorb, particularly if human intervention and decision are required.

For scientists and scholars, the need for retrieving massive amounts of information will also escalate as huge quantities of research data and entire libraries of images and books find their ways into the nation's data banks. Medicine, geophysics, and natural resources are only some of the areas now amassing enormous quantities of information.

The hunger for more data will not be easily satisfied. For the past few years expectations have been raised of a future in which information will flow freely to anyone at the touch of a keyboard. Schoolchildren will be able to access entire libraries, archives, and museum holdings. Text and images of unparalleled clarity will be transmitted to any work station and displayed on high-definition video screens. People-to-people communication via computer bulletin boards will make for virtual town

meetings of those who have shared interests.

Some of these expectations have been raised by services already in place for those of us who have access to Internet or comparable networks. But the ease of access has masked some basic problems.

Imagine it is October 13, 1999, and the statewide curriculum for third graders calls for a lesson that day on airplanes and the Wright brothers. At 10 a.m., children from all over the state attempt to reach the Smithsonian's National Air and Space Museum to obtain information on the *Wright Flyer*, the Wright brothers, their wind tunnel, or other relevant information available online. The result would probably be gridlock.

In the days immediately following publication of the first images from the refurbished Hubble Space Telescope last year, the waiting lines were so long it became virtually impossible to access the images through Internet.

The issue was channel capacity. We have known for about half a century that any communication system has a limited capacity to transmit information. The amount of data that can be sent through such a channel—whether it is a telephone line, a fiber optic link, a television cable, or a radio relay, is measured in the number of bits that can be sent per second. A bit is simply a character selected from a two-letter alphabet that consists of 0 and 1.

Increasing the capacity, or transmission rate, of information bits rapidly increases cost. If a network is to be cost-effective it will have to restrict the available number of channels, or fiber optic links connecting computers. The costs incurred will have to be paid by someone, quite likely the users, who will then insist on economies rather than overcapacity.

Information superhighways no doubt have a highly promising future, but only if we find ways to use them wisely.

—Martin Harwit is the director of the National Air and Space Museum.

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A Taste of Armageddon

When I was a dentist stationed at Malmstrom Air Force Base in Great Falls, Montana, in 1972, I was offered a tour of a Minuteman control center ("Life in the Egg," Oct./Nov. 1994). I entered an open elevator and descended a deep shaft to what looked like a bank vault. Inside the cramped center, two amiable young men wearing pistols gave me the grand tour. They showed me the console, the bunk, and the tiny shovel for digging out after an attack. And they explained how a *deedle deedle deedle* would sound the start of World War III. Then, shortly before I was to leave, it happened. The sound came over the console and both men jumped to their chairs, donned headphones, and began throwing switches. I was frozen. Would I ever see my wife and family again? After an eternity of silence, one turned to the other and said, "They're out of strawberry shortcake; how about peach cobbler?"

—James H. Arnold
Lilburn, Georgia

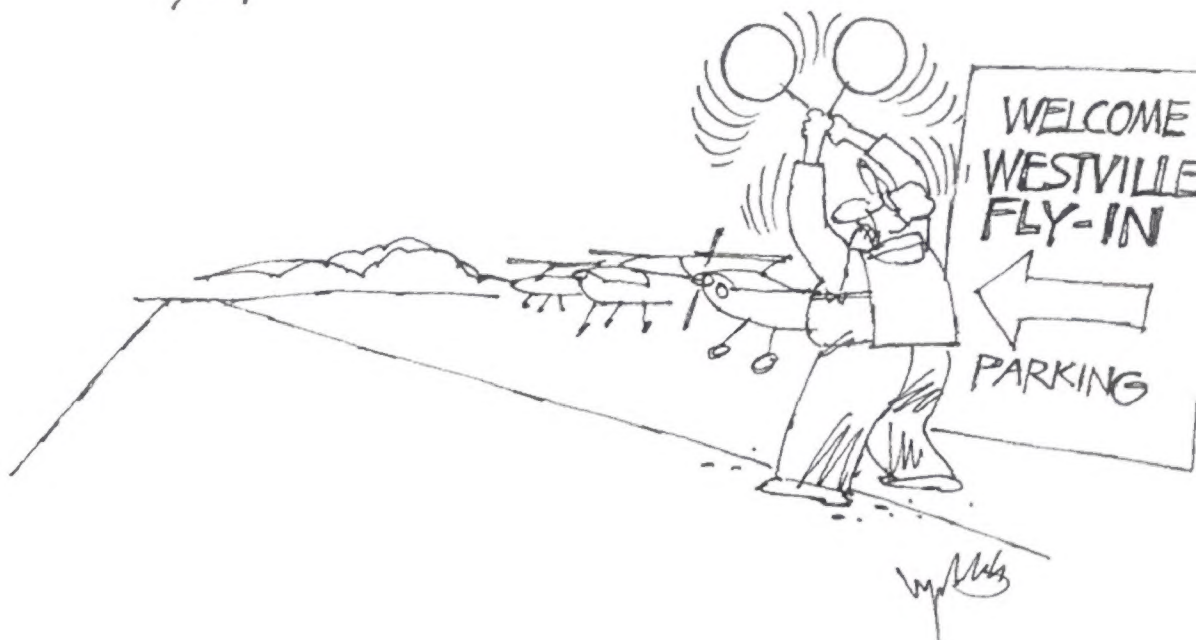
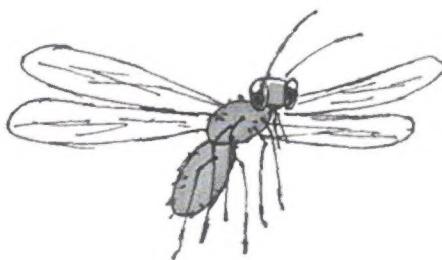
California, Long-Standing UFO Capital of the World

In "A Trip to the Moon" (Oct./Nov. 1994), Frank Winter and Randy Liebermann speculated that the design of Frederic Thompson's amusement park attraction was inspired by the work of Jules Verne or the popular novels of the period. I think it is more likely that an actual event of the 19th century was a greater inspiration.

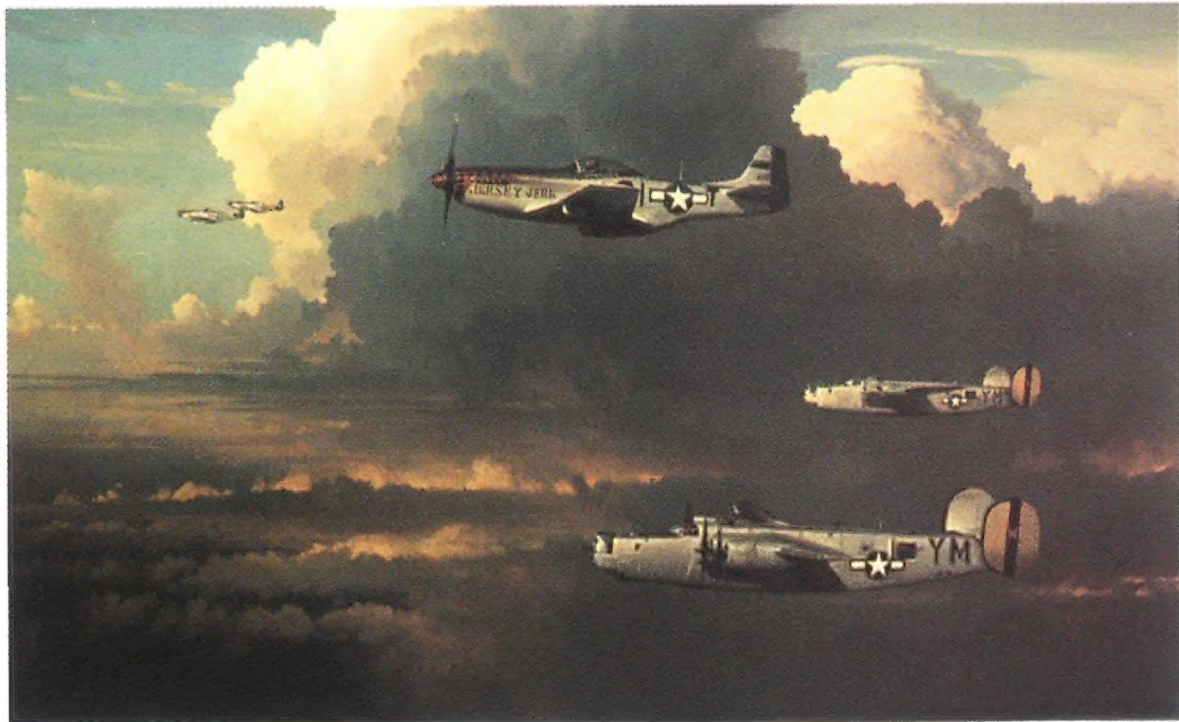
From November 1896 to May 1897, people in California began sighting mysterious cylinder-shaped airships. Some had carriages hanging from them, some had fan-like propellers, and some had flapping wings. The sightings were understandably startling: at that period of time, airships were anything but common.

It is quite possible that Thompson was inspired by these unusual sightings. In fact, one drawing, published on November 23, 1896, shows a mysterious winged airship resembling Thompson's design hovering over San Francisco.

—James Bachman
(no address provided)



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Bearphobia

"Bear Arms" (Oct./Nov. 1994) reminded me of the hysteria caused years ago by the Soviet MiG-25. When the West finally discovered its actual capabilities, the aircraft was considered much less of a threat.

I will believe the projected capabilities of these weapons once they are used in actual combat.

—Thomas Lepone
Philadelphia, Pennsylvania

Stirred by the Stearman

Thank you for "Back to the Basics" (Oct./Nov. 1994). I was checked out in the Stearman at A.C. Hyde's Congressional Airport in Rockville, Maryland, in April 1946 at age 17. I loved flying the Stearman, and I never had a problem with it ground looping. However, if someone had told me at the time that flying simply could not get any more fun than flying a Stearman, I would have told him he was crazy. I was anxious to get on to the larger, faster airplanes.

Now I am in the process of restoring a

Stearman so I can get back into really fun flying.

Stearman lovers may be interested to learn that Zenith Books distributes a wonderful two-part video copy of several World War II U.S. Navy training films (black and white) entitled "Stearman N2S Series." It presents primary flight instruction with movie actor Robert Taylor, who is wearing the Navy uniform of the day. Part 1 covers preflight and first flights; part 2 covers flight attitudes, takeoff, approaches, and landings.

—Lt. Col. Henry P. Ames
U.S. Air Force (ret.)
Suisun City, California

While stationed at Squantum Naval Base in the 1940s, we used the nickname Yellow Peril for the N3N trainer, not for the Stearman.

—Andrew Halasz
U.S. Naval Reserve (ret.)
Las Vegas, Nevada

Editors' reply: According to Stearman instructor Dick Stevens, the N3N was indeed the first to be nicknamed the Yellow Peril. However, when manufacture of the N3N ceased, the similar Stearman N2S inherited the nickname, and because it was produced in such prodigious numbers, the nickname came to be associated with that trainer.



"And if there should be a mishap, would you want your luggage donated for research at Denver International Airport?"

Is Air & Space PC?

"My Quest for Queen Bess" (Aug./Sept. 1994) was a waste of space. From the article it is clear to me that Coleman made no contribution to the field and in fact was an unskilled and/or very careless pilot. The only rationale for the story was that she was black and an activist to boot. Spare us! Keep the politically correct agenda for the fourth estate; they cover it exhaustively enough.

—J. Don Marioni
Port Townsend, Washington

I enjoyed "My Quest for Queen Bess" until I came across that God-awful term "African American." Though I was able to shake that off, I was absolutely disgusted by that crock article "Ozone Forecast: Partly Cloudy" (Oct./Nov. 1994).

For the past two years I have enjoyed reading about air- and spacecraft and the men and women who work with them. To see your magazine print an environmentalist article is, without question, disgusting. At this rate, it won't be very long until you start endorsing political candidates—who would, of course, need to be politically correct.

—John L. Berger
via America Online

And Speaking of the Ozone Hole...

Carl Posey's research in "Ozone Forecast: Partly Cloudy" was excellent, but he overlooked important data. In *Compendium of Meteorology* (American Meteorological Society, 1951), F.W. Paul Gotz writes that from 1939 to 1948, well before freon and air conditioners proliferated, G.M.B. Dobson's Arctic observing stations recorded "a gradual [annual] decrease terminating in an

UNIDENTIFIED FLYING OBJECT



Can you identify this aircraft? From time to time the National Air and Space Museum receives photographs of objects that its archivists cannot identify. The original of this image credits the Royal Canadian Air Force Photographic Establishment and identifies the aircraft as a World War I-era Austrian design called the Aviatik. While the craft does appear to have many characteristics of an Aviatik B or C type, it also has a nine-cylinder radial engine, rather than the typical in-line engine. If you can identify this UFO, write to: Letters, Air & Space/Smithsonian, 901 D St. SW, 10th Floor, Washington, DC 20024. Please type or print clearly, and include your daytime phone number. The archivists would especially appreciate photocopies of supporting evidence.

Wesley R. Smith, a former fellow at the Museum's aeronautics department, has suggested that the June/July 1994 UFO is the Blériot XXVII. Though they have yet to confirm it, the archivists believe this is a promising lead.

'ozone gap' at the end of December." Furthermore, a report by Dobson refers to a similar variation in the ozone at Halley Bay, Antarctica, based on observations taken in 1956.

—Norman S. Benes
Placerville, California

Carl Posey responds: Although Dobson instruments have been in use for many years, the U.S. instruments have been reliably intercalibrated only since the early 1960s, and the global network only since the early 1970s. Before these calibrations, the record for individual Dobson stations is peppered with occasional anomalies of the kind Mr. Benes describes for the Arctic and Antarctic. Some say these differences show stratospheric ozone being depleted before chlorofluorocarbons came into use; others that they only reflect differences between individual instruments.

Discomfort Zone

"The Unfriendly Skies" (Aug./Sept. 1994) reports that one competitor says of Aeroflot: "Close your eyes and you can almost imagine you're riding on a bus." Having made two flights inside Russia recently, I think the comment is unfair. No bus ride I ever took was that uncomfortable. I ended up choosing to sit on the airplane's floor, next to the emergency exit. The flight attendants did not comment on my choice of seating, and didn't even seem to think it was unusual.

—Name withheld upon request

Marauder Redux

In "Did He Say Five Hundred Feet?" (June/July 1994), Daniel Ford writes that the 22nd Bomb Group departed California for Townsville in northern Australia. But before that, in January 1942, the group's 77th Squadron was split off and sent to the Aleutians. The 77th was the first U.S. squadron to leave the States during the war, and it was also the first B-26 squadron to see combat. (Incidentally, the



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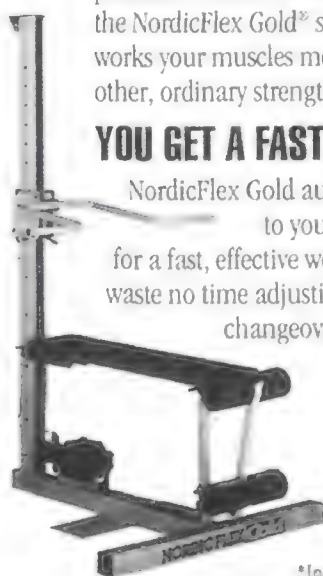
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LETTERS

squadron was equipped with the original B-26s. The later models that were so successful had six feet of wing added to them.)

—Joseph T. Pickard
Cinnaminson, New Jersey

I've always heard that one of the reasons the Marauders were moved out of the Pacific area of combat was that the Navy was increasing the number of ships out there, and the Marauder, under certain conditions, could be mistaken for a Japanese Betty bomber. The silhouette wasn't that far off. I was told the B-26s were relegated to target towing missions in the rear areas—far from young, nervous sailors.

—George MacDonald
Enterprise, Alabama

Reclusive Stars

Reading "When We Last Saw Our Heroes..." (June/July 1994), I was struck by the phrase "the Earth afloat in a starless black." Why is it that pictures taken from space don't show stars?

—Christopher Hungerland
Bainbridge Island, Washington

Editors' reply: According to Geoff Chester, production coordinator of the National Air and Space Museum's Einstein Planetarium, most of the familiar space photos we see, such as those of the moon and the shuttle, are actually taken in sunlight. (The reason the background appears black is that

there is no atmosphere to scatter the sun's light and create the kind of "sky" we have on Earth.) The film taken into space is formulated to work with sunlight, which is 12 billion times brighter than the light from the brightest star visible with the naked eye. Therefore, it isn't sensitive enough to register the light from far dimmer stars.

Truth in Advertising

The advertisement reproduced on page 87 of "The Skies, the Limits" (Oct./Nov. 1994) shows a Douglas aircraft. Why then does the caption say this was a McDonnell Aircraft ad?

—Harry R. Jones
Long Beach, California

Editors' reply: Though the illustration does show a Douglas DC-4, it was used in an ad that McDonnell Aircraft produced to promote its anti-drag ring cowls and wing leading edge sections. The ad copy reads in part: "These represent only a few of our contributions to the great job done by America's aviation industry to further the war effort. One day soon, when restrictions can be lifted, we hope to tell you about war planes of our own design and manufacture...."

A Poignant Reunion

My stepfather, Raymond O. Edgar, was very proud of the article "The Unknown Airman" (Oct./Nov. 1993), which detailed an Army Air Forces mission over Czechoslovakia in which he had participated as a bombardier. After he called your readers' attention to the

erroneous assertion that he had died, he made contact with the

article's writer, Norman Isler, who sent him the addresses of other crew members. That month,



"One small step for mouse, one giant cheese for mousekind."



"It's sad. He worked on his game until he broke 70, yet some people still remember him for walking on the moon."

Raymond developed cancer. On my first visit after he was diagnosed, he had me read the article. For the first time in years, he actually talked of the war! On my second visit, he showed me a letter he had received from the pilot of his B-17, Edward Lindbloom. At one point he was going to dictate to me a response, but he became disoriented. He died last February. I almost placed the article in his casket.

I am grateful to Mr. Isler for writing the article and bringing joy to Ray.

—J.C. Russell
Sacramento, California

Corrections

Oct./Nov. 1994 Soundings, "Pad up for Grabs": We regret misspelling Lieutenant Colonel Bobbie Gervais' name.

"Back to the Basics": Though the Stearman in the Air Force Museum in Ohio was among the last ones delivered to the military, it was not *the* last one.

Aug./Sept. 1994 Soundings, "GPS Goes Public": The military has agreed not to *further* scramble the signals of the Global Positioning System. The coarse acquisition signal remains in effect for civilian use.

"The Unfriendly Skies": We regret misspelling Khabarovsk and Sheremetyevo.

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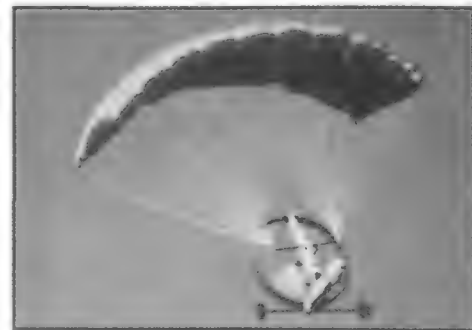
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Out of Havana



KLAUS REISINGER/BLACK STAR (2)



The twin-engine Cessna Skymaster circles low over an overloaded raft. Pilot Carlos Costa barks instructions above the drone of the engines. "When I tell you to get ready, hold it outside, and then when I say 'Drop it,' down and hard, okay? They've got four children on that thing, and they're really worried." There's a trick to tossing water bottles out of an airplane at 500 feet and getting them to splash down anywhere near their parched recipients.

The makeshift wooden boat is 20 feet long, and it is brimming with Cubans bent on escaping Fidel Castro. A day out of Havana, the exiles are bound for their dreams of political freedom in the United States. One of the 14 adults aboard is calling for help with a walkie-talkie that dropped out of the sky a few minutes ago.

"They're asking me how far they are from the coastline, and they're scared the

weather's gonna get rough," says Costa, his headset askew and a radio pressed to an ear. "I don't have any more to tell them, except that the Coast Guard's on its way. They said they didn't get enough life vests. We're going around."

It's a busy day for Costa and two other pilots who have ventured out over the Straits of Florida to search for refugees. All three wear the logo of Hermanos Al Rescate (Brothers to the Rescue). Based in Opa Locka, Florida, the volunteer group has patrolled the ocean between Cuba and the Keys since 1991. The nonprofit organization lists American Airlines and singer Gloria Estefan among its benefactors, but says it supports itself mainly through small donations from exiles in south Florida. Hermanos Al Rescate has four Cessna 337s and a Cessna 320, and rents or borrows eight other aircraft to carry out its mission. Seventeen nations are represented on its roster of pilots, including three defectors who managed to sneak out of Cuba in a cropduster, a helicopter, and a turboprop airliner.

Last July and August the group flew sorties four days a week, aiding the U.S. Coast Guard in its efforts to interdict boat people during a month-long exodus, sparked by Castro's response to a new U.S. policy on migrants that effectively cut

off Cuba. The pilots threw flotation devices, food, and water to thousands of refugees. They dropped flares to mark the location of inner tubes, surfboards, bamboo rafts, and homemade catamarans that often showed up as little more than dark specks in the sea.

The pilots themselves face a fair amount of risk. Some have brushed uncomfortably close to Cuba's coastline and have been shooed away by MiG-23 fighters. Founder and president Jose Basulto crashed on takeoff from a rocky Bahama island after delivering supplies to refugees last April. A Christmas Eve mishap in 1992 left pilot Jorge Lares in a wheelchair.

The flood of refugees slowed to a trickle in mid-September when the Clinton administration agreed to let at least 20,000 Cubans immigrate each year. Only 20 were plucked from the sea in the first week of October, but Hermanos Al Rescate kept on flying. "Mark my words, rafters will continue leaving," says Costa. "The only way to eliminate the problem is to eliminate Castro."

—Beth Dickey

UPDATE

Cold War Victim Identified

U.S. and Russian investigators found the remains of a ferret flight crew member on Yuri Island in the Pacific last September ("Beyond the Iron Curtain," Aug./Sept. 1994). In December 1993, a former Soviet sailor alerted authorities that he had taken a U.S. Naval Academy class ring from the dead navigator of an RB-29, Captain John Robertson Dunham of Easton, Maryland. Dunham had been buried in an unmarked grave after his reconnaissance aircraft was shot down by Soviet fighters on October 7, 1952.

Time Flies

They milled around Hangar 1207 at Edwards Air Force Base, stomachs paunchy, hairlines receding, boisterously shaking hands with those they recognized, peering sheepishly at the name tags of those they didn't. They could have been Rotarians on vacation or plumbers at a convention. And yet in their day, these men had broken the sound barrier, penetrated near-space, orbited the moon, and established the benchmarks for virtually every American military aircraft since World War II. Each had a different story to tell, but all shared one achievement: They'd graduated from what's now known as the United States Air Force Test Pilot School.

Several hundred of the school's 2,000 graduates returned to Edwards last September for TPS' 50th anniversary. The highlight, not surprisingly, was the hangar talk, much of it traded at a desert barbecue in the shadow of the giant stone fireplace where Pancho Barnes once held court at her legendary Happy Bottom Riding Club. "We're doing a lot of drinking and eating and talking about airplanes," said Bob Rahn, who graduated with the second TPS class in 1945 and later spent 15 years as a test pilot for Douglas Aircraft. "It's just like old times."

Flight testing in the United States dates to 1917, when the War Department classified McCook Field in Dayton, Ohio, as a temporary center for experimental flight research. For the next 20 years, flight testing remained an inexact science, with lessons passed down informally by the few veterans who survived it. Then World War II erupted, and suddenly there was a desperate need for pilots trained to a uniform standard.

"In February '43, [the Army Air Forces' Flight Test Branch] had eight test pilots, nine limited test pilots, and 10 test pilots in training," recalled Ralph Hoewing. "Well, from 1941 to 1944 alone, we had 70 experimental aircraft and new models to test, and probably an equal number of transports, cargo aircraft, and trainers. We just weren't training test pilots fast enough to keep up." Which is why on September 9, 1944, after visiting the Royal Air Force's fledgling school in England, Hoewing returned to Dayton and took command of the first TPS class.

Because the school was a route to the world's hottest aircraft, it immediately became the promised land for the country's hottest fliers. But the school was looking for aviators who combined stick-and-rudder prowess with discipline and the aeronautical expertise to converse with aircraft engineers. A number of highly decorated combat veterans didn't measure up. "I had only one apprehension," one ace recalled. "I didn't



Nuccio (class of 1990), Hoffman ('73), Yeager ('46), Hoewing ('44), and Neville ('86): "Drinking and eating and talking about airplanes" at a school reunion.

have the academic training." Fortunately, Chuck Yeager managed to muddle through and later served as the school's most celebrated commandant.

These days, with fewer airplanes to graduate to, opportunities are more prosaic. B-2 systems program director Colonel Dick Reynolds sounded wistful when he recalled his experience with the class of '79. "In a comparative sense," he said, "it was pretty boring."

Of course, it's hard to be too blasé when you're flying everything from A-37s to C-130s to F-15s and F-16s, as TPS students do now (see "Fast Track," June/July 1993). "The young men and women who graduate from here these days have to be so sharp," Hoewing said. Nearby, students in olive-drab flightsuits lingered insouciantly. Looking at them, Jim Young, Flight Test Center chief historian, added, "They *are* the best and the brightest."

—Preston Lerner

UPDATE

DC-X Upgrades

NASA has awarded McDonnell Douglas \$43 million worth of contracts to upgrade the experimental Delta Clipper and develop additional reusable launch vehicle technologies ("Single Stage to...Where?," Feb./Mar. 1994). The upgraded DC-XA will feature cryogenic liquid hydrogen and liquid oxygen tanks, a graphite epoxy intertank structure, and a gasification unit to convert cryogenic hydrogen from liquid to gas for the flight reaction control system.

Stuck at Home

Late last August, some 50 scientists and engineers spent several days in a classroom at New York University in Greenwich Village considering the normally fanciful subject of interstellar flight: Do we have the capability today to send a probe to another star?

In short, the answer was no. Although many methods for propelling starships have been proposed—nuclear fission, fusion, particle accelerators, anti-matter drive, laser-pushed sails, magnetic sails—the humbling truth is that even the closest stars are very far away.

During the workshop, which was sponsored by the Planetary Society, NASA scientist Richard Terrile offered an analogy. There are more stars in the known universe, he said, than there are grains of sand on all the world's beaches. At that same scale, the grains are seven miles apart.

Consider a star 20 light-years away, which in cosmic terms is right on our doorstep. A spacecraft accelerated to one-third the speed of light—which the workshop members used as a benchmark, even though the energy required to achieve that velocity would drain the world's treasuries—would take 60 years to reach its destination. Any pictures it sent back would take another 20 years to reach us. The equations scribbled on viewgraphs told a depressing story. Even if starflight doesn't violate the laws of physics, it runs up against economics, patience, and common sense.

Nanotechnology—building machines on a molecular scale—might be one solution to the acceleration problem, if we can learn how to shrink spacecraft to the size of a sugar cube. Better yet would be finding a way to surpass the speed of

light, through some physics as yet undiscovered. Robert Forward, a scientist and science fiction writer who has made a career of studying starflight ideas, asserted in one evening bull session that particle physics might open the way to the stars, if "somewhere in the [realm of the] small we've got a method of grabbing hold of space and time."

But for now we stay home and search for places to travel to, should we ever have the means. NASA observing programs planned for late in the decade may reveal Earth-like planets around other stars. If these are plentiful, as most astronomers expect, some might show oxygen in their atmospheres, which could signal the presence of life. Perhaps, as telescopes get more powerful, we will even see signs of civilization on a few of these worlds. What then? Would we try to make radio contact? Most workshop participants thought it would take such contact to galvanize our planet to invest in a star probe.

At times during the meeting, the conversation would turn from facts and numbers to politics, spirituality, and the nature of hope. Outside, in the square below, crowds basked in the late-summer warmth of our local star.

—Tony Reichhardt

Prop Corn

On a July afternoon in Sioux Falls, South Dakota, the corn wasn't just "as high as an elephant's eye." It was a good deal higher—doing loops, rolls, Cuban eights, and hammerheads above a crowd of 40,000. The grain had been processed into corn alcohol, or ethanol, and it powered the All-Ethanol Airfest '94, billed as the world's first airshow dedicated to promoting the alternative fuel.

Even before the performers were airborne, it was clear that this was an airshow with a twist. When the ethanol-burning Vanguard Squadron taxied out in their homebuilt RV-3s, the flightline took on the sweet smell of a distillery. The four aircraft were painted corn yellow, and the spinner of each was inscribed with a martini glass, complete with olive and swizzle stick. As the team performed, the narrator repeatedly reminded the crowd, "That's 100 percent corn squeezin's in those tanks!"

Furthering the corn agenda was Max Shauck, who flew a solo act. Probably the country's leading apostle of corn aviation fuel, Shauck won the Harmon trophy in 1989 for the year's outstanding achievement in aviation: crossing the Atlantic on straight ethanol.

The rest of the program was traditional



DAVE HIGDON/PHOTOPROSE

fare: precision skydiving, Air National Guard F-16s and visiting Canadian F-18s, a P-51 in mock dogfight with a T-6 tricked out as a Japanese Zero. With all those petroleum burners aloft, the claim that this was an all-ethanol airfest seemed a bit of a stretch. "Allow us some poetic license," urged Vanguard pilot Marv Randall.

Currently, aviation use of the alcohol is still experimental, but Shauck and others foresee a time when pilots will routinely fuel their piston aircraft with ethanol, either straight or blended with gasoline. Randall and the rest of the squadron report a substantial increase in power since switching to ethanol, and say the Lycoming engines run smoother and burn cooler and cleaner. In one hangar, Shauck briefed pilots on how fuel injectors and carburetors are modified to accommodate ethanol. If oil refineries ever abandon avgas as unprofitable, the corn advocates predict that ethanol will become vital for general aviation. They also stress that it's a renewable and homegrown energy source.

The biggest drawback to ethanol is that you must carry significantly more of it to cover the same distance you would on gasoline. Alcohol provides plenty of power when it burns, but it has a lower energy density. Gasoline and Jet A provide a

longer range for an equal weight of fuel.

Shauck admits he once took a drink from his fuel tank to convince some skeptics at the Oshkosh fly-in that ethanol had powered the routine he had just flown. Results of the impromptu taste test? "It was awful."

—Lester A. Reingold

Groomstock

It was, by any account, an odd event in the history of military secrecy. Dozens of people were hunkered down in lawn chairs on the crest of a remote ridge in southern Nevada, pointing fake cameras at a huge cream-colored blotch on the desert floor 12 miles away, while a few hundred yards away military guards eyed them through binoculars.

The blotch is Groom Lake, Nevada, the increasingly famous yet supposedly secret air base that until recently the U.S. Air Force refused to acknowledge. The unwelcome observers came from all over the country late last August to protest the Air Force plan to take control of another 4,000 acres of public land surrounding the base to prevent sightseeing.

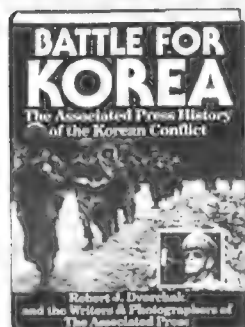
Glenn Campbell of nearby Rachel, Nevada, known by his e-mail moniker



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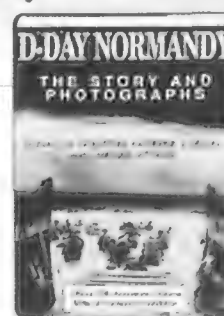


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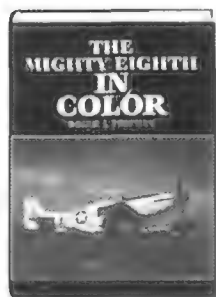
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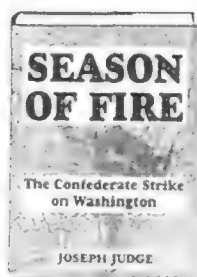
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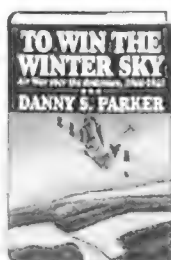
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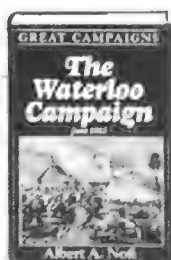
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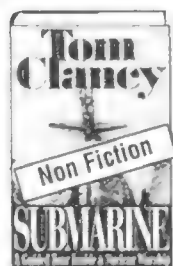
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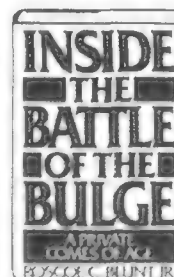
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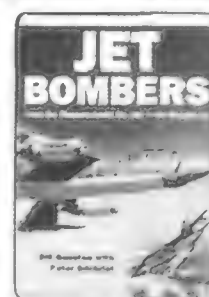
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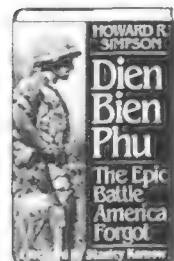
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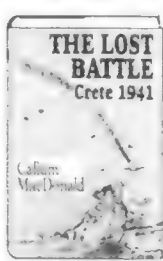
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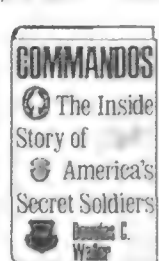
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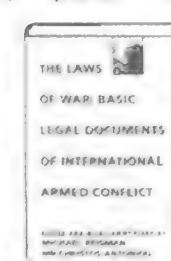
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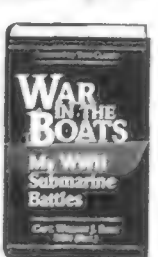
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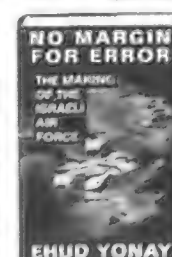
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"Psychospy," was the Grand Marshal of the event. Through his online newsletter, *The Desert Rat*, Campbell has been keeping interested parties abreast of Groom Lake developments for a couple of years.

For a place so remote—140 miles north of Las Vegas—Freedom Ridge has been busy recently. Curious visitors have been arrested for inadvertently wandering over the unmarked base border, and TV crews have been detained and their videotapes seized for appearing to point their cameras at the facility.

The Air Force decided that it needed additional protection from onlookers and initiated proceedings to annex the vantage points, which are currently public property. Public hearings have been held, and a decision from the Bureau of Land Management may come next year.

Campbell finds this all just a little silly. He points out that potential enemies of the United States know the base's location. Aviation enthusiasts know that the Lockheed U-2, SR-71, and F-117 were tested here. Satellite photos of Groom have been floating around for years, and every day hundreds of workers are ferried to the facility on a government-owned airliner that is easily spotted from the ground. The Air Force already controls more than 2,500 square miles of Nevada, yet it claims it needs to prevent the public from viewing the facilities, which include a runway, hangars, control tower, and fuel tanks, all dimly visible from Freedom Ridge with high-power binoculars.

Campbell, who figures the best way to highlight the folly of the military's plan is through a little humor, organized the land grab protest, later dubbed Groomstock. Tony Eiland, a food broker from Houston, brought a flag bearing an impromptu "Groom Lake" symbol and led a group of hikers up the three-mile trail to the top of Freedom Ridge. Tom Mahood of Irvine, California, fashioned phony cameras out of soda cans and blocks of wood, and the campers pointed them at the base to draw the attention of security guards. From nearby ridges on military property, the "cammo dudes," as Campbell calls them, kept watch. Wearing camouflaged fatigues, the guards stood near their Humvees and observed the Groomstockers for the duration.

Most of the people who made it to the top of the ridge appeared content to sit in the sun, make new acquaintances, and gaze at the distant hangars, soaking up the quiet of the desert and the mood of the afternoon. By Sunday morning, when the campfires had burned out, it was business as usual for the cammo dudes.

—Byron Harris

The Great War in Alabama

It may seem a dubious pleasure to bring back World War I, but when it's cut from four years to three days and it's all glory and no pain, don't knock it. Twice now the Great War has raged in the skies over northern Alabama and has produced hands-on history rather than casualties.

Billed as the world's largest World War I fly-in, Aerodrome '94 drew more than 50 replicas of early fighters from all over the country to Gadsden Airport last August. Its irrepressible organizer, Frank Ryder,

BRIAN NICKLAS



is an industrial inventor, artist, poet, and old-airplane nut. His Replica Fighter Museum in Guntersville, Alabama, houses his collection of over 40 aircraft (the number varies, usually upward), and it was to display them in flight that he organized the first fly-in in 1992. To Ryder's delight, scores of fellow enthusiasts showed up to fly their own replicas. Ryder and his unique squadron decided to make their flying circus a biennial affair.

The replicas are usually about 80 percent the size of the originals and are powered by modern engines or meticulous copies of the originals. Most are delightful to fly—simple, responsive, and untroubled by most nervous habits. Then again, touching down in a crosswind in a triplane with narrow landing gear can be a stimulating experience.

One of the many highlights was the chance to watch a rotary engine start up. This engineering brainstorm of 80 years ago cools itself by spinning around its crankshaft. It takes a team of men to prime each cylinder and spell each other at the task of yanking the propeller and the attached engine around. They're rewarded by a snapping sound that smooths to a steady snarl and a whoosh of blue smoke redolent of castor oil. The

cylinders become a silver blur as they hoist a Fokker Triplane, Sopwith Pup, or Sopwith Camel. Replica 80-horsepower Le Rhônes powered all three in Alabama.

Ryder leaped tirelessly from one cockpit to another, roaring off in a Sopwith Pup to tangle with an Albatros or in a Fokker D-VIII to chase a Bristol Fighter. One of Germany's newest airplanes—it barely made it into the war—was the Siemens Schuckert, here painted purple and green with a four-blade propeller. Among the oldest represented was the Nieuport 11, the *Bébé* that the

Lafayette Escadrille flew in 1916. A flight of four, calling themselves the Dawn Patrol, arrived from Kansas City by truck and trailer. The pilots explained that flying a World War I replica in a headwind simply takes too long. "It's discouraging to see trucks on the highway pass us," said one.

Ten, eleven, a dozen airplanes flew an intricate pattern above the crowd, roaring after one another and buzzing the strip. The Bristol

Fighter and a two-seat Halberstadt took cameramen up in their rear gunners' cockpits. Antique cars tooled about and a PA system played "Tipperary" and "Over There." After a couple of days, most people were ready for a bit of leave in Paris.

—Edwards Park

UPDATE

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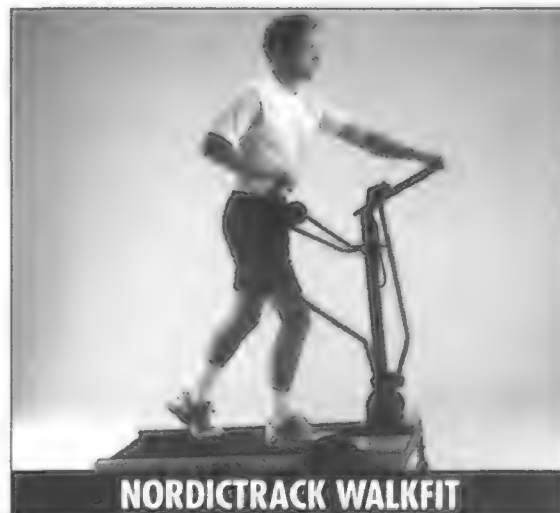
The Air Force admitted last September that the wreckage found near Roswell, New Mexico, in 1947 ("Aliens in the Basement," Aug./Sept. 1992) was not remnants of a weather balloon but rather that of a sonar balloon that was listening for nuclear test blasts in the Soviet Union. Project Mogul, a highly classified program, sent aloft numerous polyethylene balloons fitted with sensors and radar reflectors. But winds often carried the balloons out of radio range, and the program was shut down in 1950.

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Looking After an Icon



CAROLYN RUSSO

How does it feel to work on the *Enola Gay*?" I'm often asked that question, particularly by reporters, and it leaves me at a loss for words, for the truth is that most of the time I don't have any strong feelings about it. As a technician who preserves and restores aircraft at the National Air and Space Museum's Garber facility in Suitland, Maryland, I find the job of restoring the famous B-29 engrossing, but still, it's hard to sustain an emotional intensity about something you've been working on daily for over two years.

Today's task is polishing a section of aluminum skin on the forward fuselage. Directly above my head are the painted black letters spelling out the airplane's name, but I can't see them from where I'm seated. I'm working on a two-foot-square panel outlined by flat-head rivets, and because the panel is on *Enola Gay*'s underside, I have to support the weight of my six-pound polisher by bracing my elbows against a propped-up knee.

I brush a meager amount of polish onto the panel—carefully, for polish works best when it is used sparingly. As soon as I start spreading it with the air-driven polisher, the entire panel turns black. The polisher must be kept in constant motion or the polish will "burn," leaving a mark. Smeared polish gets onto my forearm as I continue to work, and soon a deep blue-black gloss starts to appear on the panel. The gloss is eventually replaced by a silvery shine, pockmarked with black. *Enola Gay* sat outside for many years, and corrosion has left her once-smooth skin pitted. The pitting on this panel is not as bad as the deep, ugly pits on the adjoining panel, which (I note with gratitude) has already been polished by someone on our team. The pits will always be there, we like to joke, but when we're finished, they'll be *shiny* pits.

As the shine emerges from the dullness, I begin to notice the fine ripples in *Enola Gay*'s skin. The bulk of the fuselage is shaped like a cylinder, but the

nose tapers to a rounded end, so the panel I'm polishing has a compound curve, like that of a shallow dish. Fifty years ago, at a Martin or Boeing plant, a massive hydraulic press used tons of force to shape this curve from a flat sheet of aluminum, leaving the ripples in its wake. They are so minute that I can barely feel them with my fingertip, but with the years of corrosion removed, they have become visible again. If you look at photographs of *Enola Gay* taken on the Pacific island of Tinian, you can see them clearly.

An odd mark appears, highlighted by a residue of black polish. It looks as if someone has laid an aluminum thread on the skin in the shape of a tiny bowknot, no more than three-eighths of an inch long. I continue to polish, studying the surface one square inch at a time. Interruptions occur: talking to a colleague about the impact of new environmental regulations on our painting operations, helping a volunteer mix paint, giving a VIP an abbreviated tour. At break time, a co-worker and I gossip about the latest volleys in the controversy over the exhibit in which *Enola Gay* will be displayed, and speculate about the possible repercussions (see "*Enola Gay* and a Nation's Memories," Aug./Sept. 1994).

Polishing again, I concentrate on a spot near the middle that still seems cloudy. The rest of the surface, though, reflects as perfectly as a mirror (except, of course, for the pits). The bowknot has turned out to be two small intersecting gashes, probably caused by pebbles tossed up during a long-ago landing. Because the mark is part of the B-29's history, it is not a restoration concern.

I step back from the panel to assess my progress, and take in the entire forward fuselage. It is huge: just under 60 feet long and 19 feet in diameter—the size of a mobile home. Today I have polished two whole panels and part of a third, an area about the size of two large placemats.

I spend my days fretting about minutiae—are we running out of polish? do we need gasoline for the air compressor?—and day by day the details

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IN THE MUSEUM

add up to another small unveiling of a history that can't be ignored. *This is the airplane that dropped the atomic bomb on Hiroshima and changed the world forever*, I think, and I'm sobered by the fact.

As I'm signing out at the end of the day, a fellow employee calls out, "Hey! I was looking at *Enola Gay* today, and she's looking really good!"

"Yeah," I say, "she's coming along. We'll get there."

—Anne McCombs

Bad Risk

When Alexander de Seversky applied for a life insurance policy in 1936, he had to answer the usual questions about his age, health, and occupation. Forty-two years old and healthy, Seversky, a corporate executive, had nothing to hide.

His line of work, however, made the Mutual Life Insurance Company of New York think twice about insuring him. The third item on the application form inquired: "The Insured has not made, nor does he contemplate making aviation flights, or aeronautical ascensions." As president of the Seversky Aircraft Corporation in Farmingdale, Long Island, Seversky had, in fact, logged thousands of miles in the air on business trips and as a test pilot for his own company.

Even though Orville Wright had taken to the air more than 30 years earlier, flying was still considered a rather risky venture—risky enough to require that Seversky fill out an entire "AVIATION FORM" detailing the number and nature of flights that he had made in the last three years.

Last year, Mutual of New York (as the company is now known) donated microfilm of the entire Seversky file to the Museum's archives department, where it is now available to researchers. A close

examination of the documents reveals the company's anxiety about insuring someone who repeatedly left the safety of the ground.

Born in Russia in 1894, Seversky was a pilot in the Imperial Russian Navy. An injury he sustained after he was shot down in World War I necessitated the amputation of his right leg five inches below the knee. Fitted with an artificial limb, he continued flying. He came to the United States in 1917 to work as a military attaché at the Russian Embassy. Eventually, he became a U.S. citizen and started working for the U.S. military as a consulting engineer.

In 1931 Seversky founded a company to manufacture his designs for all-metal amphibious fighters; seven years later, he had designed and built the precursor to the P-47 Thunderbolt, which achieved combat fame during World War II. Initially, Seversky did all the test flying himself, but eventually two company pilots took over the task. Even so, the business and personal trips that Seversky made in his own airplane and on airliners were considered "undue risks" by the insurance company. According to Seversky's \$100,000 life insurance policy: "Death as a result of operating or riding in any kind of aircraft, whether as a passenger or otherwise, is a risk not assumed under this Policy..." If Seversky had died in an aviation mishap, his beneficiary would have received only the balance of his account at the time of death.

"He was a higher-than-average risk," says Sharon Fullerton, a Mutual of New York archivist. "He had a leg amputated. He was an aviator. So it amazes me we insured him at all." When Seversky applied for a new policy in 1940, the aviation restriction was modified: he was covered if he died in an airline accident that didn't involve flying more than 600 miles over water, but no other aviation mishaps were covered. (The company felt it had reason to be concerned. One of its



Though seriously injured in World War I, Alexander de Seversky never quit flying; instead, he acted as test pilot for his own designs, including the SEV-3 floatplane.

policyholders was humorist and film actor Will Rogers, who died, along with pilot Wiley Post, in a 1935 airplane crash near Point Barrow, Alaska.)

Mutual Life's thirst for knowledge about its potential policyholders extended well beyond the category of aviation. A four-page, single-spaced report on Seversky compiled by a company investigator covers 10 items, including aviation, character, and "sanitary conditions of residence." From the report, dated September 28, 1936, we learn that Seversky had "stomach attacks apparently caused from overeating," that his domestic environment "appears to be of the best and there is no gossip to the contrary," and that he "does not use tobacco and only takes an occasional glass of wine." Seversky and his wife Evelyn, who was also a pilot, lived in an expensive house on Long Island where they employed five servants, and while their life together appeared to be a quiet one, company inspectors still felt the need to talk to neighbors and co-workers. "These investigators took their job very seriously," says Fullerton. "I think that they sort of got into it."

For all the company's concern about Seversky's flying, however, it needn't have worried. On August 24, 1974, at the age of 80, Alexander de Seversky died of a respiratory ailment.

—Diane Tedeschi

Museum Calendar

Except where noted, no tickets or reservations are required. To find out more, call Smithsonian Information at (202) 357-2700 Mon.-Sat., 9 a.m.-4 p.m.; TTY: (202) 357-1729.

December 3 "The Day the Sun Stood Still." Einstein Planetarium director James Sharp discusses the strange way the sun will behave on December 21. Einstein Planetarium, 9:30 a.m.

December 8 G.E. Aviation Lecture. "Flight Testing the YF-22," Dave Ferguson, director of flight testing at Lockheed. Langley Theater, 7:30 p.m.

January 26 G.E. Aviation Lecture. "50 Years of the International Civil Aviation Organization," David Hinson, administrator of the Federal Aviation Administration. Langley Theater, 7:30 p.m.

Museum Visits For a free planning packet, write Smithsonian Information, Smithsonian Institution, Washington, DC 20560 or call (202) 357-2700. Daytime parking near the museums is limited; visitors are urged to use the Metrorail subway system.



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THE AIRSHIP HANGAR AT THE TOP OF THE WORLD

Loose scree scudded down the steep slope each time I grappled my way higher up a narrow ridge on an uninhabited Arctic island called Danskøya. Few archeologists conduct research this far north, and none have ever done aviation archeology at this latitude. Norwegian for "Dane's Island," Danskøya is only 700 windswept miles from the North Pole. The nearest telephone was 100 miles away; the nearest town, almost 200. Oslo, the capital of Norway, was well over 1,000 miles to my south. I was suddenly struck by what was for me a major irony. Too skinny and nearsighted to be the astronaut of my boyhood dreams, I was exploring the closest thing our planet has to the cold surface of Mars.

Finally reaching the top of the ridge, I gained the view I had worked 10 years to see: the desolate shoreline of Virgo Harbor, where in 1906 the American journalist and explorer Walter Wellman established a base camp. From this small and historic harbor on the northeast corner of Danskøya, Wellman launched two airship expeditions in search of the geographic North Pole.

Now, in the short Arctic summer of 1993, I surveyed the ruins of Wellman's hangar, collapsed on the rocky shore like the remains of some prehistoric beast. Clouds of kittiwakes buzzed my ridge, shrieking as if in laughter at the evidence of the human folly below. It was a majestic sight, one I longed to capture, but my camera lay at the bottom of the harbor, where I had dropped it my first day on the island, watching it sink with something akin to grief.

Why did I journey 5,000 miles to study aeronautical artifacts in such a bleak place? Couldn't I have gleaned enough details of Wellman's expeditions from books, or from visits to an air museum? Several cruising yachts visited lonely Danskøya while I was there, and that was the question each group asked me. Yes, certain details can be dug out of books and other documents, but Wellman, like many interesting characters from history,



In a 1909 photograph, the ribs of Walter Wellman's airship hangar soar as if in tribute to the spirit of exploration.

left behind no plans, no diary, and comparatively few photographs. And no museum had preserved either of his Arctic airships.

The only place, then, to discover the details of how a polar airship was put together in 1906 is on Danskøya. Only three hangars were ever designed specifically to house polar airships, and all three were built in the Spitsbergen archipelago; the remains of two of them lay on the shore at Virgo Harbor. As these aeronautical base camps had never before been mapped, one of my major goals was to use a laser rangefinder to create a plan of the site.

Aviation archeology is often regarded by academic professionals as the province of amateur groups seeking Amelia Earhart's *Electra* or some other famous wreck. Little archeological work has been done with the aim of elucidating particular events or general trends in aeronautical history. Neither has aviation archeology been applied to a far more complex process for which it is especially suited: that of offering general propositions about

human behaviors, such as the urge to explore. As technology opens ever more avenues of exploration, such research can only increase in importance.

So, in addition to the technological details of his expeditions, what I sought was some direct connection with Walter Wellman and his world. The newspaperman had launched two sledging expeditions in search of the North Pole, one from Spitsbergen in 1894 and one from neighboring Franz Josef Land in 1899. The 1894 voyage reached 81 degrees north latitude faster than any other known expedition before Wellman's ship was trapped by ice and sunk, creating the world's northernmost shipwreck.

In his 1899 voyage, Wellman pushed another degree north only to break his leg. With every painful retreating step, he grew more determined than ever to reach the North Pole. He was now convinced that the only true route to the pole was through the air. He would wrest the exploration from the 19th century technology of sails and sledges and bring

it into, as he billed it, “the Aerial Age.”

A Swedish explorer, S.A. Andree, had sought the pole in 1897 by floating from Danskøya in the *Eagle*, a balloon controlled by drag ropes of limited utility, only to vanish with two companions. Wellman thought he had a better idea: a powered airship, capable of being steered and of fighting headwinds—unlike Andree’s *Eagle*—could reach the pole from Andree’s launch point in about 24 hours. A flight in 1907 covered about 20 miles and another went twice that far in 1909. But later that year Wellman learned that Robert Peary and Frederick Cook had both claimed to have reached the pole. He abandoned his northern base camp, never to return.

As efforts to reach the North Pole, Wellman’s expeditions were failures (one newspaper opined, “[Wellman] has always been daring in his conceptions, but rather backward in his performances”), but they did blaze a technological trail that other explorers, notably Roald Amundsen, Lincoln Ellsworth, and Umberto Nobile, would soon follow. Wellman himself enjoyed pointing out that when the pole was finally and unquestionably attained by Amundsen’s airship *Norge* in 1926, it was done with the aeronautical methods of Wellman, not the sledging tortures of Peary. Wellman lived to see the day when the *Norge* lifted off from a hangar just south of Danskøya, reached the pole, and continued on across the top of the world to Alaska.

While surveying Wellman’s base camp, I discovered the wrecks of the two airships used on his polar flights. The original ballast bags, still filled with rocks, lay underneath his collapsed hangar. Behind the hangar, I drank from a wooden funnel that still channels icy water from a spring toward Wellman’s hut, as if, after 90 years’ absence, the old aeronaut himself would somehow reappear and take a drink.

While the details of these and other artifacts begin to reveal something of Wellman’s world, they also open up whole new avenues of inquiry. For one, there’s the construction of the framework of the airship’s nacelle. Photographs taken after the last flight show that the frame buckled at several points. On Danskøya, I was able to trace these failures to a vital metal joint at which the wooden frame was joined. It was an inherently weak structure. Did Wellman know this? Did he ignore it? Does such construction tell us anything about his seriousness or that of the Frenchman who designed it? Or was such construction standard on French dirigibles of the day, and if so, what was the basis for believing it could survive in the Arctic?

And what of the can with “Chicago, U.S.A.” printed on it, which my guide,

Lucy Gilbert, discovered, or the bottle fragments I found with “Lambert Pharmacal Company” molded across it? I have since learned that Lambert Pharmacal was located in St. Louis, and that their only product at the time of Wellman’s flights was the ubiquitous Listerine. Were these simply items Wellman packed for himself? Or were Midwestern corporations donating supplies to Wellman’s expeditions, and did they have ties to his employer, the *Chicago Record-Herald*? If so, what advertising advantage did Lambert hope to gain by having its mouthwash reach the North Pole? (Today the phrase “First on the North Pole” appears on cans of the popular Norwegian beer Mack Ø1. Perhaps Lambert thought such a slogan would be more romantic than “Even your best friends won’t tell you.”) Wellman’s expeditions were repeatedly criticized as little more than stunts aimed at raising the

Today the hangar lies in ruin at an otherwise unchanged Virgo Harbor.



circulation of his newspaper, and these artifacts could buttress an analysis of such criticism.

Even though Danskøya is as remote as any Polynesian atoll, several kayakers from Oslo on their own dangerous adventure paddled in to our shoreline camp one night, and I am greatly indebted to one of them, an architect named Wilhelm Munthe-Kaas, for lending me his camera to photograph the site. The next day, once again, I scaled my ridge, and once again the kittiwakes laughed. But the last laugh was mine, for I got my picture of the airship hangar at the top of the world.

The night before the Norwegian vessel *Polarsyssel* returned to take my guide and me off Danskøya, we tore down the wire perimeter rigged with explosive charges that served as our alarm against polar bears. For three weeks we had seen only reindeer and a solitary Arctic fox, and for three weeks I had hiked around large sections of the island armed with nothing more than an antique flare pistol. But at 5:00 a.m. that morning we were awakened by a barely perceptible noise just outside our tent. Through the tent flap grommets I saw an enormous white back, less than 10 feet away, stalking around the tent. I cocked my flare pistol, Lucy cocked her rifle, and we crept to the flap of the tent. There, in the cold, in our underwear, we waited, momentarily paralyzed.

When we didn't hear another sound we finally escaped from the tent and saw that the bear had gone, as quietly as it had come. With the alarm down, we had been completely surprised. We checked our weapons. I fired the flare pistol: it worked. The rifle—our only real defense—was hopelessly jammed. Had the bear charged the tent we would have been as good as lost. Shaken, we cleared the rifle, fired it twice, and cautiously explored the surrounding hillocks and ridges. We found no trace of the fearsome intruder.

We did, however, find a friendly lone French kayaker, a visitor to our camp several days earlier, whom we thought had left the island. Bad weather had pinned him down. He said our shots had awakened him and, sitting up in front of his tent, camera at the ready, he had casually snapped photographs of the bear as it wandered by his camp. “The camera might have shaken a little bit,” he said, adding with a slightly strained insouciance, “probably because my hands were cold.” We invited him back to our camp, where we sat, our guns laid on the table as if in some Wild West saloon, silently drinking cup after cup of hot chocolate.

Just as Walter Wellman never made it to the North Pole, it's unlikely I will ever persuade NASA to take me to Mars so I can practice archeology on those mysterious pyramids. But studying the artifacts Wellman left behind on Danskøya brought me a little closer to an understanding of what drives us to reach for such places, and gave me an appreciation of the cost. For despite the shoddy workmanship and the possible commercial tie-ins, despite naysayers and stay-at-homes, in the final analysis there is always man: vulnerable, naked, the noble explorer and the courageous fool, at once blessed and cursed by a tormenting vision, straining to roll back the frontiers of ignorance with an open heart—and fresh breath.

—P.J. Capelotti

BEAST INTENTIONS

As an engine technician under contract to Allison, I worked at Edwards Air Force Base in the early 1950s on an experimental turbojet engine. For test purposes, the Allison X-71 was installed in a modified North American B-45 Tornado four-engine bomber. The engine was mounted in the reworked bomb bay on a retractable mount. Due to its location in the B-45 and the engine's size, we nicknamed it the Beast in the Belly.

In flight, the X-71 was extended and fired up for testing. The five-engine bomber gave the F-86 chase planes a run for their money, particularly in the rate-of-climb department.

The Northrop F-89 twin-engine interceptor was one of the first production aircraft slated to receive the X-71. Two of the new engines would replace the two smaller engines that powered previous production versions.

For documentation purposes, Allison wanted a photograph of their borrowed B-45. Further, they wanted pictures with the Beast extended and running, and beyond that, they wanted the airplane hurtling at full speed at ground level, with all five engines churning and burning.

You didn't just wander around Edwards carrying a camera, which was, for obvious reasons, a restricted item. Allison asked the Air Force for permission for me to carry a camera to take some company photographs. I was given a card identifying me as an Official Air Force Flight Test Center Photographer.

The photos of the B-45 would be taken head-on. The control tower was to be phoned in advance of the takeoff and advised that I would be on the main runway centerline to photograph each of two passes. The B-45 was to take off, lower the Beast from the bomb bay, fire it up, and call the tower for permission to make two high-speed, low-altitude passes.

When the B-45 took off I jumped in a jeep, carrying my Speed Graphic Press

camera and a stereoscopic camera. The driver took me out between the taxiway and the runway. We had a receive-only radio in the jeep tuned to the tower and could hear the B-45 crew telling the tower they were preparing to start the first pass.

I looked in both directions, and with some trepidation ran out on the runway toward the black tire marks. Thoroughly winded when I reached the center, I flopped down on my back. My feet were pointing toward the approaching B-45, which was about four miles out over Rogers Dry Lake. I pointed the big Speed Graphic toward the bomber, which was now building up speed and streaming



black smoke. I spread my legs to keep my size-13 shoes from framing the picture.

Watching the bomber drift lower, I felt a mounting concern, and by the time it came thundering toward me I was feeling distinctly vulnerable. It was at a much lower altitude than I expected, with the Beast hanging down like the Sword of Damocles. The instant the bomber filled the viewfinder, I tripped the shutter, then flopped flat on my back to avoid getting my head knocked off. The noise was deafening and the jet exhaust nearly lifted me off the ground. The air around me crackled loudly with static electricity. It occurred to me that this whole procedure wasn't a very good idea.

As the B-45 entered a wide pattern for the next pass, I switched to the stereo

camera and braced myself for the second run, which was even lower than the first. I snapped the stereo shot and fell back on the runway, and again static electricity crackled viciously.

Glad that it was over, I picked up my cameras and ran for the jeep. As I jumped in I sensed something was amiss. The driver seemed quite anxious to get moving. We roared off without a word.

"Where are we going?" I asked, puzzled by his erratic path.

"Back to the building," he mumbled.

"This isn't the way," I protested.

"Oh, we'll get there," he said, "I'm just taking a different route."

"What the hell is wrong?" I finally asked.

"The tower has been screaming on the radio, 'There's a *man* lying on the runway! A man lying on the runway!'"

"Well, sure," I said. "That was *me*. The tower knew from the phone call what our plan was. They *knew* I was going to be out there lying on the runway. Right?"

Silence.

"Well, didn't they?" I persisted.

In a barely audible voice, he replied: "Harry forgot to call."

Looking back over my shoulder, I saw the air police vehicles milling around the runway where I had been lying. I was a fugitive. No wonder the driver had taken such a circuitous route to our building. He was trying to elude the police.

When we got back to the building I hid in the darkroom, ostensibly to develop my film. I stayed there for quite some time—long enough to develop all the footage shot for *Gone With the Wind*.

A few months later the project ended. The Beast found its way into several new production aircraft, but not the F-89. With the installation of two Beasts in place of the original engines, the interceptor mainly just got heavier.

—O.H. Billmann

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Dreams for Sale

Maybe you wanted to be a fighter pilot. Or fly an airliner. It can still happen—for a price.

by William Triplett

Tom Bishop, commercial real estate broker, is trying to figure out how to adjust his copilot's seat in the Lockheed Constellation. If it seems like this is his first time in a big airplane, that's because it is. Meanwhile, Dave Kunz, the pilot, wearing cowboy boots, jeans, and an Arizona Feed & Grain cap, is calling for the flight engineer.

"Right here," replies the engineer, seated behind Bishop and Kunz.

"APU?" asks Kunz.

"On."

"Generator switch?"

"On."

"Warning lights?"

"Out."

Bishop is leafing through his checklist, trying to catch up, his face alternating between intense concentration and abject confusion as he tries to collate what's happening with what he was just taught. A few hours ago the airplane was an abstract collection of systems; now he's in the cockpit of the real thing, and the Constellation, legendary beauty that it is, has Bishop as flustered as a sailor on a date with Rita Hayworth.

If you are the sort of person who can see an airplane as the expression of its times, you might see in this airliner the



glamour of air travel in the 1950s. "Everybody was always dressed up," says the airplane's owner, Vern Raburn. As a child, Raburn had watched Constellations flying in and out of the Tulsa airport, a refueling stop for transcontinental flights. The son of a Douglas employee, he saw plenty of DC-4s, -6s, and -7s too. But, he remembers, "the Connie was just so much prettier."

Suddenly Kunz calls out, "Starting number three!"

Engineer: "Three's hot!"

The right inboard prop does a languorous, whiny turn, then whips into a blur as the engine spits smoke and kicks to life.

"Starting four!"

"Four's hot!"

Four whines, spits, kicks to life, the sound of the Wright R-3350s now rumbling through the metal floor and inside people's chests. Kunz looks at Bishop and says, "You start the other two."

Bishop reaches for the switch, his hand hovering uncertainly.

"Now?" he asks.

"Now."

"Starting one!" he calls out.

Bishop's eyes light up as number one joins the chorus.

Tom Bishop's dream awaits. Flight engineer Bill Dodds walks him around the Connie (opposite) before he takes his place in the cockpit.

"Starting two!"

"Two's hot!"

The sound reaches a low-pitched, choppy roar. Kunz and the engineer check readings. Bishop follows along and helps out, and from the look on his face he's starting to feel like he's really part of the crew. Which is nice, since he will eventually be in command.

Kunz taxis, swings the Connie into position on the runway, and locks up the brakes.

"Takeoff checklist!" Kunz calls out. Bishop searches for his copy as Kunz runs through it off the top of his head with the engineer, then turns to Bishop and lays out how the takeoff will go. When Kunz applies take-off power, Bishop is to call out airspeed at every interval of ten knots. "At 60 knots," Kunz says, "I'm giving the airplane to you."

Bishop nods his head tersely, his eyes wide and intent, like a man looking at the ground before parachuting for the first time.

Kunz throttles up, and the tension builds with the rising power of the engines. Amid the deafening crescendo Kunz releases brakes, and this icon of a bygone era, with its three tails and dolphin-sleek body, eases forward.

Bishop nervously juggles the yoke, manual, and his eyeglasses. "Forty knots!" he says. "Fifty!...Sixty!"

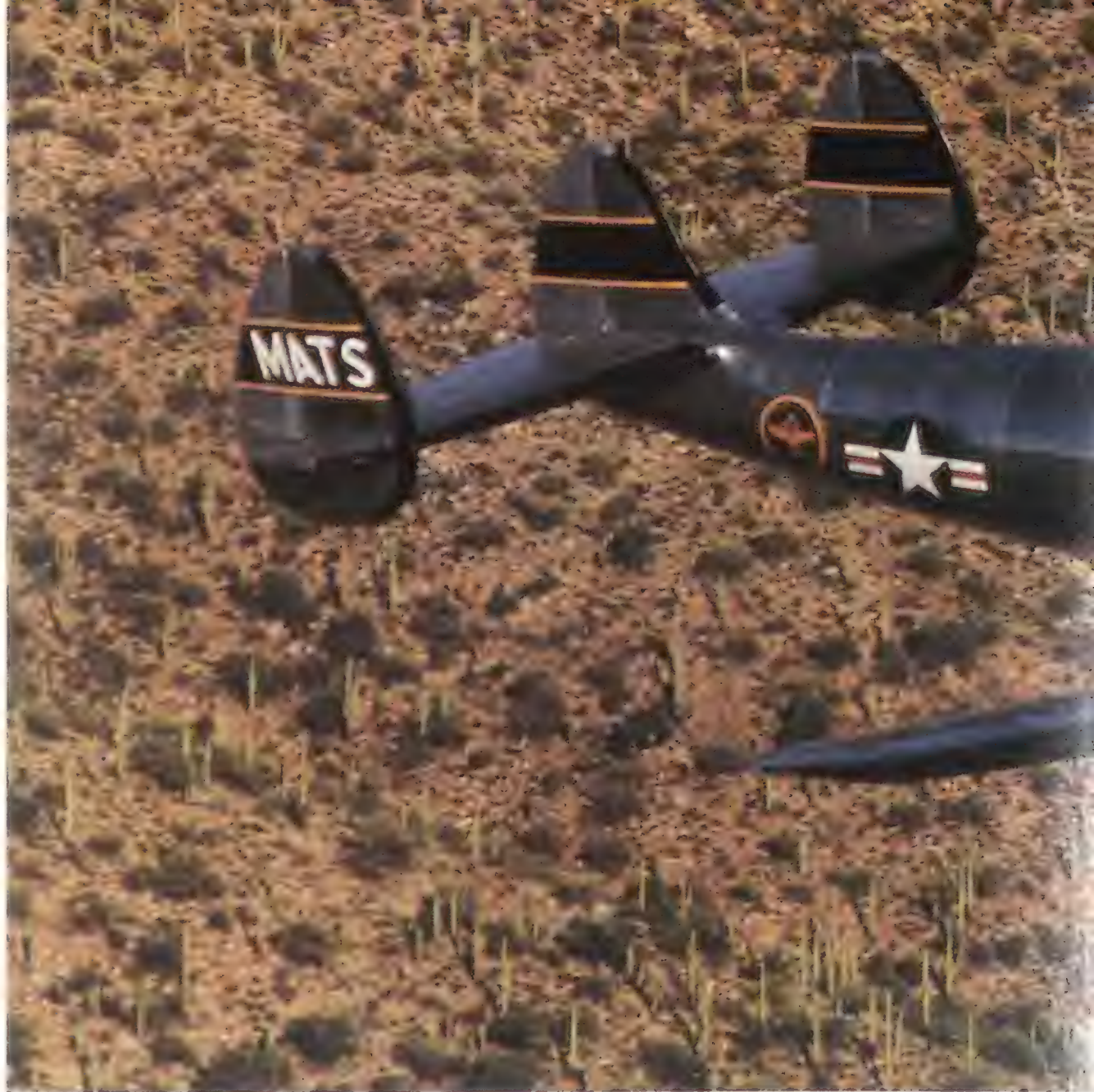
Kunz shoots back, "Your airplane!"

Every muscle in Bishop's forearms goes taut as he grips the yoke. His neck stiffens. The manual slides off his lap. His gaze is fixed down the center of the runway.

"Vee-one," Kunz calls out. A moment later: "Vee-two. Let's go flying!" The moment Bishop has waited for—the moment he has shelled out four thousand bucks for—has arrived. He pulls back on the yoke, and the big airplane's nose rises gently, lifting off the racing concrete below, rising into the dazzling blue sky above the Tucson desert. He holds her steady. And for the next hour or so, Tom Bishop, middle-aged regular guy from Austin, Texas, will no longer exist. Meet the other Tom Bishop—Connie line pilot, captain of a four-engine transport, a man trying to find out if he ever had the right stuff.

"Well," says Kunz, "what do you think?"

"I don't know what I'm doing," Bishop says, "but it sure is fun!"



In an age when virtually anything from sex to Ping-Pong can be approximated on a computer terminal, simulation has become contemptible, as unappealing as artificial flavor to those who want to experience life. One group of adventurers has found the way to fulfill fly-

ing fantasies by actually living them out. With the help of a few simpatico entrepreneurs, just about anyone with enough money can find himself piloting some legendary aircraft from the past or present.

"The appeal is definitely that it's hands-



GEOFFREY CLIFFORD (3)



Top: A long, lovely 116 feet from nose to tail, this Constellation entered service in 1948 as a C-121, a transport that flew dignitaries like Dwight Eisenhower and Douglas MacArthur. The airplane requires teamwork in the cockpit (above) and a lot of gas. Engines twice as powerful as a B-17's gulp 100 gallons of fuel an hour.



on," says Lee Lauderback, who, with his partner Doug Schultz, sells time in the cockpit of an authentic World War II fighter. "You're not just riding in it, you're flying it." The appeal is also widespread. One operation claims to be getting around 100 calls a day, and one Walter Mitty nearly wiped out his retirement savings to make his fantasy come true.

A mere fad? Simply the latest fix for a generation of adrenaline addicts? Maybe. But watching the pilots-for-a-day, one has the feeling that this entertainment is not a passing fancy, and the price of a ticket proves that it's not just cheap thrills. Flying a real McCoy steeped in a certain mystique reaches right inside to who these people are. Or, perhaps more to the point, who they'd rather be.

During the second world war Tom Bishop was a kid working the cotton fields in southern Texas. "The Army Air Corps used to fly training missions nearby," he recalls. "I'd see these big planes fly over and I'd say to myself, 'Hell, I can drive a tractor. I bet I can drive one of them too!'" When Bishop was 20 years old he had a good chance, he says, of making it into Air Force flight

school, but the Army drafted him first. Since then he's managed to get a private pilot's license for small aircraft, but the dream of flying the big airplanes never let go.

Fortunately for him, Vern Raburn had a crush on Connies and a head for business. In the early 1980s, Raburn realized that for any vintage airplane, the number of people who want to fly it increases as the number of flying models decreases. Raburn enlisted the help of a colleague who specializes in old airplanes and searched through registries for Connie owners. He learned that actor John Travolta had one (they'd made an impression on him too, as a kid watching them fly over his Brooklyn neighborhood). "He was going to donate it to the Air and Space Museum, but I convinced him not to," says Raburn. He told the actor he would keep it flying.

"Flying this airplane and doing it well is one of the most satisfying feelings in life, because you're doing it with other people," Raburn says. For the Connie the Federal Aviation Administration requires a cockpit crew of three, which Raburn, an amateur musician, likens to a musical trio backed by an orchestra

of four engines. "If you've ever played music together with other people and played it well," he says, "the feeling of satisfaction is very much the same." Raburn bought Travolta's airplane for \$100,000, certain that there would be, like himself, people who'd pay for the experience of flying it. He was right. Tom Bishop is the 12th of 14 graduates of the year-old Connie Flying Program, run by Raburn's Scottsdale, Arizona business, the Constellation Group, Inc.

The muscles in Bishop's neck have relaxed, his grip on the yoke is limber, and, with obvious delight, he puts the Connie through steep turns, levels, then turns again. "It never fails," Dave Kunz says. "As soon as somebody flies it a little while, they realize it responds to controls a lot like any other airplane. That's when they really get into it." Kunz, the FAA examiner for piston airplanes in the Southwest region, is one of a dozen pilots who teach people to fly Vern Raburn's Connie. Raburn himself gave Bishop his four hours of ground school before the flight.

Kunz says to Bishop, "You'll get a kick out of the way this old girl stalls!" He puts a few more thousand feet between the airplane and the ground, then



ALAN S. WEINER (3)

has Bishop raise the nose while cutting power. At 90 knots a slight vibration rattles the cockpit. "There's a nibble," says Kunz. The airplane suddenly does a shuddery dance as it begins to slip from the sky. "Max power, flaps to take-off, nose over!" Kunz calls out. The Connie levels out, at which point Kunz simulates failure of two engines. Bishop rides it out like a pro.

After a happy landing he is as animated and elated as someone who has just found a cherished possession he'd long believed lost. "Great!" he exults. "Absolutely great! Terrific!" He and Kunz appraise his performance—what he did well, what he could have done better, what he should work on if he decides to fly again. It is a debrief, just like what real pilots go through, and he can't seem to get enough of it. To say he is a satisfied customer is to say the Pope is sort of religious. Tom Bishop got much more than an hour at the controls of a classy old airliner. He got the answer to a question that's bugged him for half a century.

Erik Brockdorff was well into his 30s before he even realized he wanted to be a pilot. "A friend called one day and said he was going to take flying lessons, did I want to go?" says Brockdorff, who has owned or operated ser-

vice stations all his life. "I went on a lark," he says. "Two days later I bought an airplane." These days he flies a Baron, but the object of his desire has always been that workhorse fighter of World War II and object of worship of mythic proportion, the P-51 Mustang. "It was love at first sight when I saw one," he says. "It's the sexiest thing out there. For cars, it's the '67 'vette—one of which he owns—for airplanes, this is the one."

Lee Lauderback has heard it before. "We get people from all backgrounds," he says. He and partner Doug Schultz, owners of Stallion 51 Corporation in Kissimmee, Florida, have turned over the controls of their Mustang to everyone from 12-year-olds to grandmas. "Some have pilot experience, some don't," Lauderback says. "But the one thing they all have in common is the word 'Mustang.' They all want to fly it."

Brockdorff thought there would always be time to fly one. Then last year he turned 50, which has a way of making you wonder how much time is left. Then he was in a plane crash, which *really* has a way of making you wonder. "It scared the living shit out of me," he says. "I was in a [Cessna] 182 when a 172 hit us in midair." Three people were killed in the crash. "It made me decide to start doing a few things I'd always

wanted to do," says Brockdorff.

He ponied up \$1,600 and got himself down to Kissimmee airport, where he now sits in a small office getting briefed. "It's going to look like we're about to bury the prop in concrete because the plane flies nose-down, but don't worry," says Lauderback. "The Mustang also has a reputation for vicious stall characteristics. I think that's a matter of opinion. We'll do some and you can form your own."

Brockdorff, in denims and sport shirt, sitting with hands folded on the table and his ankles crossed beneath it, smiles, nods, and occasionally asks about gross weight, hydraulic boost, and other World War II fighters that were liquid-cooled. The tone of the conversation is not unlike that of sommelier and connoisseur discussing a wine of extraordinary vintage. But what puts a gleam in Brockdorff's eye are the moments when Lauderback says "you'll" be doing this, or



"you'll" be doing that. The sexiest airplane out there will be responding to his touch, and his alone.

It's the transcendent fantasy—to be not simply a pilot, but a fighter pilot. Heroic loner. Flying cowboy.

Out on the tarmac Lauderback walks Brockdorff around the P-51. "The basic airframe, the engine, the prop—really most everything you see on the outside is original," Lauderback says. "It was built in 1944, modified in the early '70s." Some 15,000 were built altogether, he says, but only about 75 are airworthy today. This particular model—a dual-cockpit, dual-controlled TF-51—is one of only about six trainers left. Brockdorff absorbs the

information slowly, appreciatively.

"Okay Erik," Lauderback says. "Time to go."

"Awright!"

Lauderback helps him strap into the rear seat, then climbs into the front seat and runs through the preflight checklist. "Let's wake up the Merlin now," he says, starting to crank the engine, which fires up smoothly. They taxi out to the runway, where, in a matter of seconds, they become a silver blur. The fighter leaps into a steep climb and trails off into the sky.

Lee Lauderback and Erik Brockdorff signal "ready" for their one-hour flight (opposite, left); once in the air (opposite, right), Brockdorff loves every minute of it. Bruce Carr flew a real Mustang when it was a real fighter. He adds a lot of experience and a few war stories to the operation.

An hour later they are back on the ground. Brockdorff climbs out of the cockpit with a grin almost as wide as the Mustang's wingspan. "Awesome!" he yells.

Back in the briefing room Lauderback cues up the videotape of the flight made from the cockpit cameras. The client gets to see himself putting the airplane through rolls, loops, S-turns, and other aerobatics. *See?* the tape seems to say, *You really did it! It wasn't just a dream!* No surprise, then, that this plastic spool of magnetic ribbon comes to mean so much. "One guy's kid taped a cartoon over the video of his ride," Lauderback says. "The wife found out first and called us frantically asking for another copy. We told her we don't keep copies. She said, 'It's a matter of life and death!' We apologized, but we couldn't help. She ended up buying her husband another ride."

Doug Schultz knows the obsession;

it's the reason he got into the business. He'd wanted to be a fighter pilot since he'd been a kid. The Navy eventually trained him in F-4 Phantoms and launched him many times from aircraft carriers during the Vietnam war. "But I'd always had a soft spot for the Mustang," he says. After leaving the Navy, he saw a classified ad offering one for sale. "I thought, there's *got* to be people like me who've dreamed of flying a Mustang!" At last count, there are over a thousand. And Brockdorff, firmly holding on to his videotape, says he will gladly add his name to the list again just as soon as he can come up with the money.

For people like Michael Mettler, Bob Threatt, and Mike Saemisch—an executive with a packaging materials company in Germany, the chief financial officer of a real estate development firm in Connecticut, and an aerospace





engineer in Utah, respectively—being a fighter pilot has meaning only if you get to fly a modern jet fighter, preferably supersonic. Each has long imagined himself driving a sophisticated multimillion-dollar war machine that outguns its adversary because of its advanced capability...and the steel nerve of its pilot.

“Shoot!” said Saemisch when he saw an ad in an airline in-flight magazine saying he could go to Russia and fly a MiG. “They’re selling dreams!”

Indeed they are. If your pocket change ranges from, oh, \$5,500 to \$51,000, you too can fly a really cool piece of Soviet military hardware, courtesy of MiGs, Etc., a company based in Sarasota, Flori-

da. It’s the brainchild of Kent Ertegrul, an American entrepreneur who teamed up a year ago with the Gromov Flight Research Institute, which, as the principal test facility for all Russian-made aircraft, has access to every kind of Russian jet. Mettler, Threatt, and Saemisch all signed up for what’s called the Long MiG-29 Program. Price tag: \$12,750 per



ALAN S. WEINER

To Erik Brockdorff and a thousand others who paid to fly the Mustang, "It's the sexiest thing out there."

classified military field about 20 miles southeast of Moscow. Guides from MiGs, Etc. drive the pilots-to-be to the base's administration building, in which they undergo a two-hour physical exam. It's perhaps more extensive than necessary, but none of these guys came for "necessary." They came to feel real, and the feeling starts with an ice-cold rubber strap across the naked chest.

"Shirt off, please," says a Russian woman in a white jacket to Bob Threatt, who shyly complies, then wishes he hadn't when the strap is placed around him. The woman then attaches metal sensors—even colder—beneath the strap to monitor his heart and respiratory system. She has him climb on an exercise bike and crank up to a very subsonic but tiring 20 kilometers an hour (12.4 mph) for several minutes.

In another room, another woman in a white jacket asks Threatt dozens of questions through an interpreter about his medical history. A half-hour later he's in a third room with two more white-jacketed women, who peer into every back corner of his eyeballs with a tiny light. So it goes for all three men until they are each handed a lengthy form in Russian, attesting, they are told, to their current good health.

It's on to the fitting room, where G-suits, flightsuits, and helmets await them. Their nervous laughter and chatter diminish as every zipper is zipped, snap snapped, and buckle buckled, making Mettler, Saemisch, and Threatt start to look much like the career fighter pilots who will guide this trio around the sky. They may still walk a little like tourists and carry their helmets a bit awkwardly, but this is, after all, just the first day.

The flightline exudes a certain outpost or frontline atmosphere. Edges of the tarmac are littered with various older fighters and helicopters showing distinct signs of having been looted for parts by mechanics. The ground crews wear normal work clothes, not uniforms.

Vladimir Danilenko, the Russian pilot who will take each client up in the Czech-made L-39 trainer, sports a U.S.

person, Moscow airfare not included. "Sure it's expensive," says Saemisch, who cashed in a sizable chunk of his 401(K) retirement account to pay for this ticket. "But what's the cost of an unfulfilled dream?"

In this case, it appears you get what you pay for. Unlike flying the Connie or Mustang, the Russian adventure is

a four-day affair that includes three appetite-whetting sorties in a jet trainer before the one in the MiG. The idea is to build a jet fighter pilot identity the way the Russians appear to have put together the Kremlin—slowly but solidly, and with melodramatic effect.

It all begins on a Monday morning at Zhukovsky Air Base, the formerly



Top: Over Russia's Zhukovsky airfield, MiG-29s-for-hire give pilots a great view of Moscow's environs.

Bob Threatt gets a zip and a tuck as he suits up for his high-altitude flight in a MiG-25.

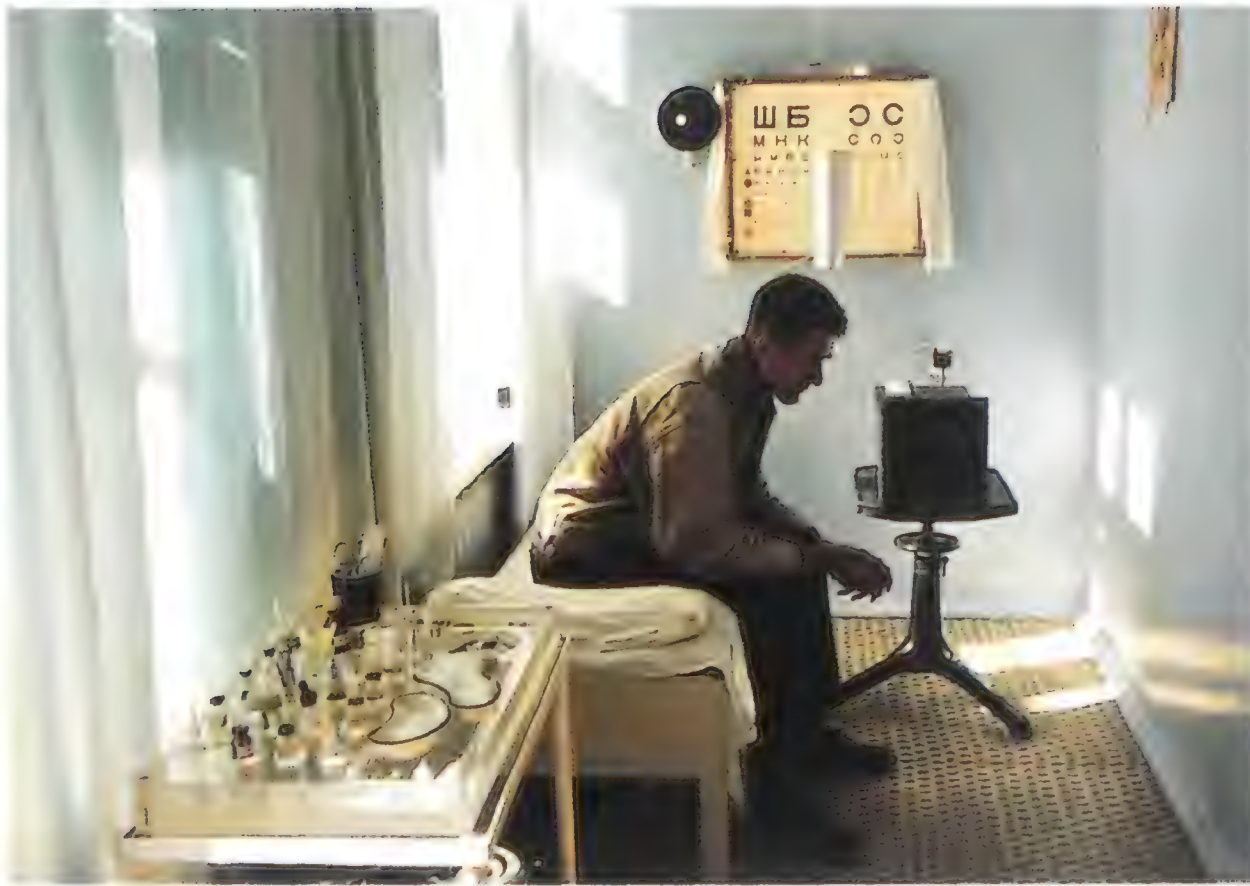
Navy "Top Gun" cap along with a couple of fresh scrapes and a bandage on his face. He warmly greets his new charges and quickly briefs them on the flight plan. "This is demonstration of what will come in MiG," he says. "We take off. At 100 meters altitude [about

330 feet], we circle airfield. Then we fly to aerobatic zone and begin aerobatics at 1,000 meters altitude. We do some rolls, loops, some splits, whatever you like. Then I give controls to you. Questions?" *Nyet*. One after another they roar off into the sky.

Afterward, the three compare their flights. Threatt, a mild-mannered fellow one would never suspect of harboring multiple-G fantasies, raves about the maneuvers he pulled. Saemisch, an outgoing outdoors enthusiast who has never piloted any aircraft before, is equally delighted. Only Mettler isn't keen on the experience—he's discovered his stomach and head don't like aerobatics. Fortunately, he has two more trainer flights to sort out exactly what he will and won't want to do in the MiG.

On Tuesday, though, a low, thick cloud cover severely limits any aerobatics in the trainer (which suits Mettler just fine). Saemisch is content to do low-level banks and turns, but Threatt has a burning thirst for height and speed and thus decides to go for broke, so to speak. In addition to his MiG-29 flight later on, he's plunking down an extra \$5,000 for a ride today in a MiG-25, a high-altitude interceptor capable of

TIMMY NICHOL, KATZ PER JAMES



For paying pilots, reality begins with the physical. Left: MiGs, Etc. customer Andy Devlin sweats the results of his eye exam. Although English-speaking pilots are not required to read the Cyrillic chart, vision is checked with cheerful thoroughness (below). Mike Saemisch grinds on an exercycle to prove he has the heart for a flight in a supersonic fighter (bottom).



Mach 2.6 at 80,000 feet—well above the cloud cover—where the sky begins to blacken at the edge of space and Earth's curvature is plainly visible.

At that altitude, he will need a pressure suit. In the fitting room, as more and more of him disappears under layers of protective gear, his expression is a mix of bewilderment and amusement. "I think my heart rate is going up," he says. There's no time to be concerned. The grandmotherly woman who supervises the fitting drives the astronaut-like helmet down over his head, secures it, and closes the visor. Threath's only thought: *What if I get airsick and puke? I'll drown!*

Threath's pilot gives him the brief: "We take off with afterburner. We climb to 10,000 meters and level off. Then we start acceleration to supersonic climb and we go to maybe 22,000 meters. Questions?"

"Can I fly it at some point?"

"Da!"

"I'd like to do an aileron roll."

"Da, sure!"

The MiG roars off the runway trailing twin spikes of blue-white flame from the afterburners and disappears into the clouds. Some 30 minutes later the jet lands, trailing a drag chute. When he climbs down from the cockpit, Threath's account alternates between excitement and disappointment. The takeoff and climb were a rush, he says, but at 74,000



feet he couldn't really feel the Mach 2.4 airspeed. Plus the cloud cover severely diminished the view of Earth. He got to do the aileron roll but not much else. "I actually preferred the trainer because I got to do more maneuvers," he says.

By afternoon the next day, having finished their trainer flights, they all know just what they want from the Main Event. Mettler simply wants to control the fighter at high speed. Saemisch is ready for a full set of aerobatics. Threath is ready for anything.

The MiG-29 is an air superiority fight-

er originally designed to counter the U.S. Air Force's F-16. Its twin tails and sleek design give it great maneuverability, while its twin engines provide a high thrust-to-weight ratio and plenty of power for acceleration in a climb. Outfitted for combat, it sports a 30-mm gun, six air-to-air missiles, and a range of bombs and air-to-ground rockets. As a machine to convert dreams of being a modern-day fighter pilot to reality, there aren't many better.

Each flight begins with the jet tearing down the runway and lifting off in



JEREMY NICHOLL (5)

Vladimir Danilenko demonstrates that regardless of nationality, all pilots talk with their hands (left).

A veteran of ejection seat trials rests near a lab at Zhukovsky, the proving ground for military and civil aircraft.

less than 650 feet. At an altitude of 330 feet, the MiG rolls into a steeply banked 360-degree turn, looking as if it barely hangs in the sky. Then the afterburners kick in, the nose rises sharply, and the jet rockets out of sight. In 60 seconds it reaches 65,000 feet, at which point Danilenko demonstrates some turns and dives, then turns over the controls. About a half-hour later the jet is down to 500 feet flying upside-down over the airfield. Another 360 is followed by a graceful landing.

"Perfect!" blurts Mettler through a smile so big and bright it could be picked up on radar. "Fantastic!" cries Saemisch after his flight. "Man, those afterburners! You could feel each one kick in. They really sink you back in the seat!" Threatt can't stand still after his ride. "What an airplane!" he says. "Amazing! The tail slide has to be the world's great-



est maneuver! What an *airplane*!"

The superlatives continue to flow as everyone talks fluently about how many Gs were pulled, about angles of attack, about response time. There's laughing, backslapping, and joking with Danilenko. Anyone meeting this foursome for the first time would need a moment to figure out who's the real pilot and who isn't. Back in the administrative building, they are each given a certificate and told, "You are now members of a very exclusive club."

Since the end of the first world war, pilots have been selling rides in airplanes to anyone who had the money,

Once he's back at his desk in Utah, a photo will remind Mike Saemisch that he really flew the fighter (opposite).

Bob Threatt added 30 minutes of flying in a MiG-25 to his tour package—for around \$150 a minute.

Michael Mettler's expression says, "Make mine a MiG-29" (below).



largely as a means for ex-military pilots to keep doing what they loved to do without going broke doing it. Such was the birth of the era of the barnstormer, whose direct descendants, one could say, include Lee Lauderback, Doug Schultz, Vern Raburn, and the people at MiGs, Etc., all of whom claim that most of their hefty revenues go toward covering their also hefty operating costs. "No one's going to retire on this," says Lauderback.

The people who are paying to fly today are probably not much different from those of seventy years ago in one particular: flying caught their imaginations and never let go. But that doesn't quite explain why seemingly practical, sensible people are willing to part with a lot of money for a relatively short-lived experience.

"It's the *what if*," says Tom Bishop. "You always hit a fork in life and end up going one way. But you always wonder, *What if I'd gone the other?*" He says that had the Army not drafted him first, "I would have gone in the Air Force and I'm sure I would have stayed in aviation." Mike Saemisch had been nominated but not appointed to the Air Force Academy; MiGs, Etc. offered him the opportunity to taste what might have been. Mettler had every intention of becoming a pilot, he says, until he discovered the pay was lousy.

"It's hard to put a price on it," says Threatt, who says he would have paid double to fly the MiG. But neither he nor any of the others would pay a dime to drive a race car or go bungee-jumping or skydive. The craving is less for pure thrill than it is for a certain identity, and for a short while these people get to go back in time and down the other fork where that identity may once have waited for them. Who wouldn't pay good money for that? —

Sunset on Pulkovo

Despite revolutions, purges, and wars, the astronomers at Russia's preeminent observatory have always clung to their science on the heights outside St. Petersburg.

by Robert A. McCutcheon

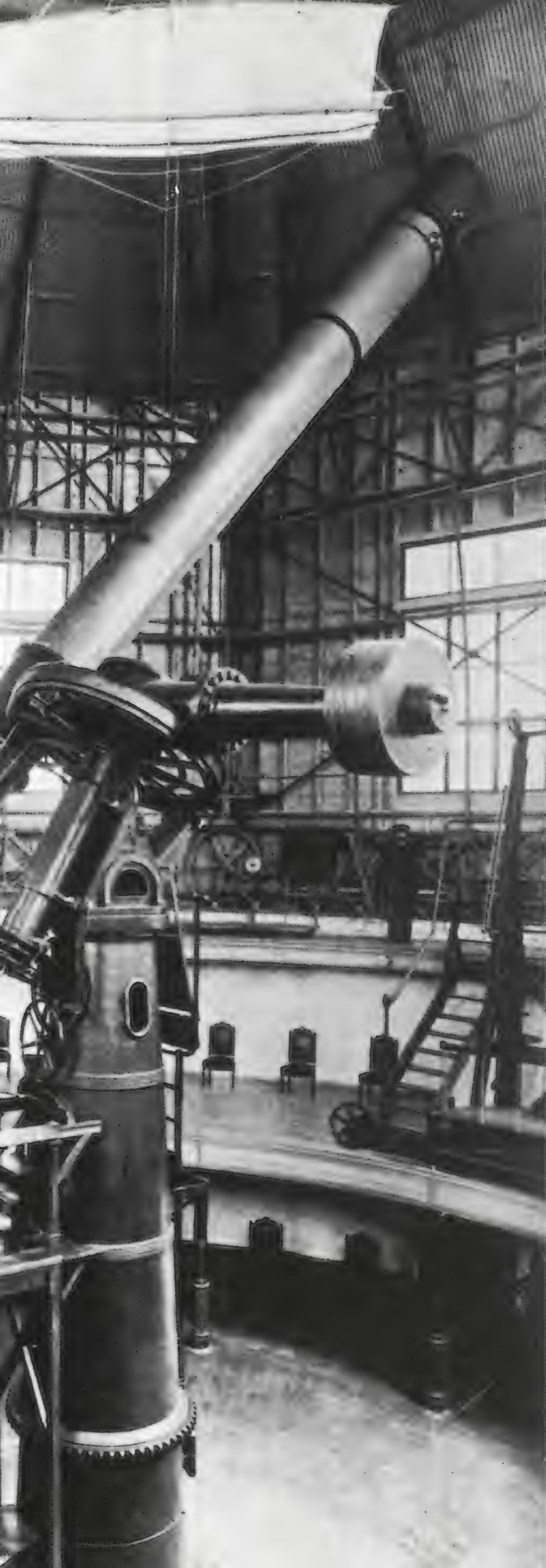
A "For Sale" sign has yet to appear in front of Pulkovo Observatory, but as I stand outside the main gate on a warm May morning I can't help but wonder when this venerable astronomical facility will go on the market. American newspapers are full of articles about once powerful Soviet institutions—even military ones—that are on the verge of bankruptcy, so what can life be like at Pulkovo? After hearing disheartening tales from several Russian astronomer friends, I have come to this historic observatory to see for myself.

It is here on Pulkovo Heights, about four miles south of St. Petersburg's city limits, that Wilhelm Struve in the early 19th century oversaw the construction of one of the greatest astronomical observatories of all time. Russia needed to map its growing empire, and Nicholas I agreed to build a lavish observatory to facilitate exploration and navigation. Struve was also allowed to tour Europe and purchase the best instruments money could buy. When completed in 1839, Pulkovo could boast the world's largest telescope: a 15-inch refractor made by the Munich firm Merz and Mahler. This telescope, as well as a transit instrument, vertical and meridian circles, and others, was housed in a single observatory building that was designed in classical style and recognized as the most modern astronomical institution of its day. After visiting the newly built observatory, the American astronomer Benjamin A. Gould dubbed it "the astronomical capital of the world."

Wilhelm Struve is buried in a small cemetery on the observatory grounds. You can find it easily: just take the metro from downtown St. Petersburg to the Victory Square station, then board the no. 55 bus, which will drop you at

BLACK AND WHITE PHOTOGRAPHS COURTESY PULKOVO OBSERVATORY





ROGER RESSMEYER/STARLIGHT



When its director, Otto Struve, posed for a picture in 1890 with a 30-inch refractor telescope (left), Pulkovo Observatory was still a leading astronomical facility. Current director Viktor Abalakin (above) hopes the observatory can regain some of its former glory.

Pulkovo's main gate. Walk in—there is no guard—and turn right. Pass several low apartment buildings and continue on a dirt path into the woods. There, on the right, you will see the cemetery surrounded by a low fence. Struve's grave still occupies a well-kept place of honor, but a bent piece of hanger wire substitutes for a latch on the gate and indicates that the cemetery is in need of care.

As I walk around the observatory grounds, I notice other signs of neglect: the buildings need a coat of paint, the observatory domes are rusted, and the roadway in front of the hotel has been torn up to replace some burst pipes. Pulkovo's heating plant is also in need of repair. Two years ago natural gas leaking from a pipe was blamed for poisoning one of Pulkovo's most respected elder astronomers, Mitrofan Zverev, in his bathroom.

"It would cost 10 to 15 billion rubles [\$5 to \$7.5 million] just to carry out necessary repairs in the main observatory building," says Viktor Abalakin, the director at Pulkovo. A specialist in celestial mechanics, Abalakin is also a historian and a polyglot fluent in English, German, and French and conversant with a number of other languages (legend has it that he once saved an African student from over-zealous customs officials by serving as a Russian-Swahili interpreter).

Pulkovo's glory under Struve and his son Otto must seem like a dream to Abalakin. Nowadays observing conditions at the observatory are atrocious, the telescopes and other instruments are outmoded, and the staff has swollen out of proportion. The original staff at Pulkovo consisted of five astronomers, including Struve. Due to hiring under the Soviet regime, by the mid-1980s the staff had swelled to 500, of whom about 150 were scientific workers. (In comparison, the staff of the U.S. Naval Observatory in Washington, D.C., totals about 170, of whom about 70 are scientific workers.)

Pulkovo is not alone in its predicament; other great observatories around the world are facing uncertain futures. But in France the Paris Observatory has survived as both a



S. CHANDRASEKHAR

at the turn of the century. The decrepit czarist government did not fund the observatory at a level sufficient to maintain it at the forefront of world astronomy. As contemporary observatories were being equipped with large reflecting telescopes for research in the new field of astrophysics, Pulkovo was left behind.

Indeed, a revolution in astrophysics was taking place

in the United States, at Mt. Wilson Observatory and elsewhere. But a revolution of another sort occupied Pulkovo. Artillery shells fell around and on the observatory grounds

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Both Pulkovo and its astronomers have suffered. Only one of the astronomers photographed in 1934 with Indian astrophysicist S. Chandrasekhar (third from left) survived Stalin's purges. The observatory, seen here at the turn of the century, was destroyed by German forces during World War II.

museum and an active research institute. In England the Admiralty turned the original Royal Greenwich Observatory into a museum and moved the astronomers to a better location in rural Sussex. In the United States, California's Mt. Wilson Observatory—certainly the “astronomical capital of the world” during the 1920s and 1930s—was saved by the efforts of concerned astronomers. Doesn't Pulkovo deserve to be treated with the same degree of reverence?

In fact, this is not the first time Pulkovo has been in decline. The dynasty established by the Struves began to ebb





The past is omnipresent at Pulkovo. A portrait of Oskar Backlund, the observatory's fourth director, hangs with paintings of other distinguished astronomers in the museum. A monument on the grounds reads: "Eternal memory to the heroes-guardsmen having perished in defense of the city of Lenin, January 1944."

in November 1917 when troops loyal to the government that had replaced the fallen monarchy rallied near Pulkovo to make a desperate last stand against the Bolsheviks. The observatory once again found itself on the front lines in October 1919, when the Red Army battled anti-Communist forces. On both occasions the astronomers were forced to hide the telescope optics and take cover in the basement.

Yet it was Stalin's reign that wreaked irreparable havoc on the observatory. Astronomers were told that their research had to be part of the country's five-year plans, and contacts with the outside world virtually ceased. The few letters from Soviet astronomers to their colleagues in the West were written carefully in Aesopian language and, if possible, sent by personal courier. "Regretting thanking cannot go," replied Boris Gerasimovich in 1937 to an invitation from his American colleague and friend Harlow Shapley to spend a

semester at Harvard College Observatory. Membership in international groups, publication in foreign journals, and contacts with Western astronomers—all those facets of a scientist's life that in the past connoted a respected interna-



tional reputation—now were viewed by Communist ideologists as "wrecking activities."

For the older, senior astronomers at Pulkovo, it must have seemed as though the world had been turned on its head. Between 1936 and 1937 at least 13 senior Pulkovo astronomers were arrested during Stalin's Great Purges. Most of them believed to the end that their arrests had been the result of some horrible mistake that would be corrected when the authorities came to their senses. Only one returned from the gulag.

Cataclysmic change, once the result of Communism's arrival, is now recurring with its exit. A revolution—in the cultural sense—is taking place once again as Russia makes a transition to capitalism, and Pulkovo, like the rest of the country, is reeling.

"I have to spend most of my time defending the observatory from robbery," says Viktor Abalakin, referring to the legions of new entrepreneurs who have descended on him. A small hotel located on the observatory grounds is consid-





ered prime real estate to “businessmen,” apparently with ties to Russian organized crime, who have twice tried to bribe Abalakin’s assistants into signing leases. There was even talk of opening a striptease bar on the observatory grounds.

Corruption of another kind greeted Abalakin in 1983 when he became director at Pulkovo. The most important matter facing him then was not the purchase of a telescope or completion of a new star catalog—it was the construction of a new apartment building. “I was sent to Pulkovo in 1983 to do battle with the Communist Party mafia,” says Abalakin. The mafia had worked out a deal to distribute 82 new apartments to party members in exchange for various privileges. “Even the ceiling heights in the apartments vary according to the rank of the intended occupant,” says Abalakin in disbelief. For nearly 20 years, this mafia controlled the observatory. “They persecuted people and tried to use the observatory’s resources for their own purposes,” he says.

The change from Communism to capitalism has led to other problems, perhaps best personified by an astronomer whom I hadn’t seen since 1988. Now retired, he lives on a pension that is below the officially published poverty line. In last year’s elections he voted for the radical extremist Vladimir Zhirinovskiy, and it’s not difficult to understand why such fierce nationalism appealed to him. In the past six years he has clearly lost weight, and I find it difficult to eat the special lunch he has prepared for me: “nozhki Busha”—chicken legs nicknamed for the U.S. president who first sent the staple to Russia as humanitarian aid following the collapse of Communism. He spends his days in front of his television watching American soap operas, which are interspersed with advertisements for Marlboro cigarettes and Snickers. “Hasn’t everything in this country gone crazy?” he asks.

When I first met this astronomer (who asked that I conceal his identity) it was 1987, and Gorbachev had just announced that he was pulling Soviet troops out of Afghanistan. It was a time of expectation in Russia. Even the Pulkovo Observatory, covered in snow, had an almost fairy tale appearance. During the five months my wife and I lived in the Soviet Union we certainly spent our share of time standing in the ubiquitous lines. I came to understand the simple joy that can come from being in the right line at the right place at the right time to be able to use a ration coupon to buy 250 grams of coffee—a little more than half a pound, my ration for the month.

For all the hardships of the old life, however, one could be assured of at least a minimal standard of living. One could always find bread, sausage, milk, cabbage, and a few other staples, and one could be certain that even a minimum salary



Pulkovo’s history is reflected in the careers of its astronomers. S.V. Romanskaia (left) was among the first generation of women astronomers who were allowed to work at the observatory, beginning in the 1920s. Nikolai A. Kozyrev (above) narrowly escaped execution in a labor camp.

or pension would keep a roof over one’s head and food on the table.

“It’s too bad they drove away the cows,” says Abalakin. Until the 1960s there were more than 100 cows on the grounds of Pulkovo; “There was never a problem with milk, butter, or meat,” he says. Fortunately, a tradition of gardening continues at the observatory. If you walk south from the main building for about five minutes you will find a huge field of garden plots stretching off into the distance. During the famine that followed the Bolshevik Revolution, the astronomers bartered their potatoes for what they could not grow.

Now you can find everything in the stores of St. Petersburg—even kiwifruit. The only problem is that the prices are about the same as those in a large city in the United States, which is above the income of the majority of Russians. At Pulkovo salaries are a pittance, and worse, one cannot even be certain of being paid. As of May, no one at Pulkovo had been paid in three months.

Despite the difficult financial times, astronomy there is still alive. Scientific work continues on star catalogues and astrometric observations of the planets, their satellites, and star clusters. Astrometrists at Pulkovo have also developed



It remains to be seen whether the astronomical equipment at Pulkovo will continue to perform research or eventually become museum pieces.

plans for a space-based milli-arcsecond-level astrometry experiment. (So far only NASA's Hubble Space Telescope and the European Space Agency's Hipparchos satellite have attempted space-based astrometry, each with difficulties.) In addition, Pulkovo's astronomers and instrument makers have developed plans for other astrometric instruments, including an automated horizontal meridian circle that will improve the accuracy of ground-based astrometry.

One positive outcome of the current hardships at Pulkovo has been new cooperation with Western astronomers.

Pulkovo's astrophysicists have been working with astronomers at the University of Arizona, which has loaned a polarimeter for conducting observations of young stars and other objects. Another area of cooperation involves the study of solar oscillations.

The work requires new instruments, but the observatory can't afford the inflated prices of the new capitalist market. It's a Catch-22 for Pulkovo. Previously astronomical instruments were unavailable due to production inefficiency during the Communist era. This was vividly recalled recently when a one-meter reflector telescope was delivered to Pulkovo—25 years after it was ordered.

Some fifty years ago Pulkovo faced another test of survival and failed. Not far from Struve's grave is a memorial that



ROGER RESSMEYER/STARLIGHT

commemorates the soldiers who fell when the observatory was recaptured during World War II. As the German army advanced in 1941, the staff managed a last-minute evacuation to save the library, including its priceless collection of Johannes Kepler manuscripts, as well as the lenses of the 30- and 15-inch refractors. They also hastily built a protective cover around Wilhelm Struve's tombstone. For the next 900 days the German army besieged Leningrad, as St. Petersburg was known then, and Pulkovo was captured by German forces. Finally, in January 1944 the Red Army broke the siege with a thrust south over Pulkovo Heights. By then the observatory was gone. The soldiers who recaptured the grounds found nothing but rubble.

And then something very surprising happened. The Soviet government decided that the observatory should be rebuilt as a symbol of the resurrection of Soviet science after the devastation of World War II. The reconstruction lasted nearly 10 years, and in 1954 astronomers from around the world came to Leningrad for Pulkovo's grand rededication. They found a beautiful 19th century-style observatory rebuilt in almost exactly its original form.

Yet the decision to rebuild Pulkovo epitomized the worst thinking of the Communist bu-

reaucracy. From an astronomical viewpoint there were already good reasons not to rebuild the observatory. Pulkovo's telescopes had long before been surpassed in the West. In addition, Leningrad had grown dramatically, and the observing conditions on Pulkovo Heights—never ideal to begin with—had begun to deteriorate markedly. A major airport built next to the observatory made observing conditions even worse.

Pulkovo moved most of its telescopes to new locations with better observing conditions—mainly in the southern reaches of the Soviet Union and in Central Asia. With the exception of a solar station in Kislovodsk, the new stations were located outside Russia in places such as Ukraine, Armenia, Azerbaijan, and Tajikistan—all independent republics now. Until recently civil war has raged around many of Pulko-

vo's former stations. When Azerbaijani troops took over Pulkovo's station in Nakhichevan, the station director was not even allowed to gather his possessions.

Now Pulkovo once again faces a test of survival. "I'm an Optimist," says Dmitrii Polozhentsev, one of Pulkovo's best known positional astronomers. "It seems that our government is made up of educated people who understand the need for fundamental science."

He blames some of Pulkovo's current troubles on politics. "Once Pulkovo was in the list of those institutions where they brought visiting foreign presidents, prime ministers, kings, etc.," says Polozhentsev. "This, of course, helped to spread Pulkovo's name. But now it seems Pulkovo is no longer on that list."

Astronomers in the United States are still hopeful. "Most of the technical work seems to be going forward," says David Dunham of Johns Hopkins University, "maybe at a slower pace than before." Gert Westerhout, the former science director of the U.S. Naval Observatory in Washington, D.C., believes that Pulkovo will survive and says it continues to be much in evidence at international scientific meetings. "Pulkovo is experiencing the same hard times as every other science organization in what used to be the Soviet Union," he says.

"Perhaps UNESCO can help," Viktor Abalakin says wistfully. Privately I wonder if he eventually will have to strike a deal with the mafia. After several hours of talking about the situation at Pulkovo, his smile has faded somewhat. I ask if he has ever considered resigning. "I can't," he replies. "It would be like abandoning a sinking ship."

"I would like to do my work in celestial mechanics, on the theory of astronomical ephemerides, and on the history of astronomy," says the observatory director. "I would like to travel to the libraries of the world. I would like to publish the correspondence between Giovanni Schiaparelli and Otto Struve.... But I can't do it due to the lack of both financial means and personal freedom. All of my time is taken up by administrative matters. It's as though I am moving through a resistant medium."

We say goodbye, and Abalakin hands me a stack of correspondence with the request that I mail it in the United States. "It's not that the mail is censored anymore," he explains. "It's just that the postal workers don't want to be bothered with handling the mail."

It is almost 10:00 p.m. on an early June evening, and I stand alone in front of Pulkovo's main gate waiting for the bus that will take me back to St. Petersburg. The White Nights have arrived; the sun still shines brightly. In the city center I know that people are strolling down the Nevsky Prospekt and along the Neva River embankment.

My bus arrives, and as I board I take one last look at Pulkovo's main gate. The shadows are deep now, and I look to the northwest where the sun is finally setting. The White Nights are deceptive. The days are long, the sun is slow to slip below the horizon, and twilight lasts all night. As my bus rounds the bend and the observatory domes disappear from view, I wonder whether the sun might have already set, finally and irrevocably, on Pulkovo, the one-time astronomical capital of the world. —

The Success Equation

J. Randolph
Babbitt
President,
Air Line Pilots
Association

When managers look at their airlines' noncompetitive costs, the frequent trend has been to lay the cost problems squarely at the feet of labor.

No one familiar with the perilous financial condition of many U.S. airlines would deny that serious problems exist in the industry. Since the advent of deregulation, we have seen the failure of three major, long-established airlines: Braniff, Eastern, and Pan Am. Midway, considered to be the very model of the new breed of airlines spawned by deregulation, failed. Countless smaller airlines that started up in the early years of deregulation are now only sad memories.

Today we are seeing a whole spate of new entrants, and the beleaguered majors are desperately seeking ways to become competitive with these new low-cost airlines. Managers at the full-service airlines are comparing their operating costs with those of bare-bones operations and finding drastic differences. Some of the differences reflect the costs of services these major airlines provide that some low-cost airlines do not, such as interline baggage handling, pre-assigned seating, and meals. Obviously, fair cost comparisons can be made only if the same services are provided.

Unfortunately, when managers look at their airlines' noncompetitive costs, the frequent trend has been to lay the cost problems squarely at the feet of labor and ask for wage cuts. But these managers are missing two vital elements in their survival equation: (1) productivity and (2) utilization of equipment and personnel.

Many airline managers cite Southwest as the airline to emulate. They look at its relatively low costs and say they must cut their own costs in order to compete. But they neglect to observe that Southwest is a highly unionized airline, with salaries comparable to or better than those of the employees of other major carriers.

So if the secret of Southwest's success isn't low salaries, what is it? There are many elements, not all of which can be successfully copied by other major airlines. For instance, Southwest flies only one type of aircraft. This reduces maintenance costs, pilot training costs, mechanic training costs, and so on. In addition, the airline flies point to point: direct, usually short routes that permit

quick turnarounds and high utilization of both aircraft and crews.

Other major U.S. carriers, on the other hand, use the hub-and-spoke system, which is expensive to operate. This system brings passengers to large hub airports and then sends them to many different destinations on other airplanes. By providing such a variety of routes, the system generates traffic and maximizes yields—the amount of revenue derived from each passenger mile. However, in a hub-and-spoke system, aircraft frequently sit idle, waiting for the next wave of flights. Flight crews are less productive because they have to wait around at airports until it's time to fly again.

Management can't have it both ways; if the choice is high yield, management can't blame labor for being unproductive. Ask any crew member which he or she would prefer: to complete the day's flying in fewer hours or to kill time in airports. I doubt if you'd find any who preferred the airport to home.

Federal Aviation Administration regulations limit the number of hours a pilot can fly in a month. It doesn't matter to the FAA if those hours are completed in 10 days or 20. However, it does matter to management because pilots are paid for hours spent on duty, even if they're just waiting in the airport. If management is serious about reducing costs, it must find a way to utilize both aircraft and personnel more efficiently.

In addition to improving utilization, managers need to examine total operating expenses. From 1980 to 1990, travel agent commissions rose from 3.4 percent of operating expenses to 10 percent. In the same period, equipment rentals also increased tremendously, from 1.8 percent to 7.1 percent. Landing fees rose, advertising and other promotions rose, and maintenance, food, and interest costs increased.

On the other hand, the percentage of expenses for salaries and benefits actually dropped, from 37.3 percent to 33.8 percent. The average employee cost has risen slightly since 1990, but largely as the result of furloughs at many airlines: the lowest paid employees generally are the ones furloughed.

Perhaps the most damaging statistics can

To find financial stability, airline managers need to look beyond their employees' wallets.

be found in taxes and fees. Every aspect of the industry is taxed virtually to death. Federal user taxes and fees paid by airlines total over \$5 billion a year. Airport user fees, expenses for meeting noise abatement standards—these are costing the airlines big bucks.

Some of these costs can't be changed, but others can. Bringing about such changes, however, requires a high level of cooperation between airline managers and their employees. And too many managers apparently feel the easier route is to place the burden directly on the employees.

Because of this, the Air Line Pilots Association has had to develop ways to protect our members. Through a tough learning curve during the early years of deregulation, we developed an effective financial analysis process. If our economic analysts determine that an airline faces a serious financial situation, our pilots have consistently been willing to work with management in order to keep their airline viable. However, after many years of seeing concessions wasted on fare wars and other misguided corporate strategies, ALPA resolved that concessions in wages and working conditions should not be provided unless the company had developed a workable business plan. We have also sought a return for our investment, whether it be in stock ownership, seats on the board of directors, or another form of sharing in the future of the airline.

The most striking example of employees' sharing control of their destiny is the recent acquisition of majority ownership of United Airlines by its employees. Aside from giving employees a stake in the future of the airline, the transaction incorporates reducing labor costs, adopting a plan to compete in today's changing industry, and changing the management culture through the selection of a new CEO, Gerry Greenwald, and through corporate governance provisions to enhance employee job security.

Cooperation between labor and management is paramount, but we also need the support of enlightened government policies. Last year, I had the honor of serving on the National Commission to Ensure a Strong Com-

petitive Airline Industry, and we developed many excellent recommendations for ensuring the viability of our nation's airlines. The commission members didn't make the mistake of pointing to any single factor (like employee salaries) as the cause of the industry's ills. Instead, we looked at the entire array of causes, and the commission recommendations are therefore far-reaching and wisely considered. I've joined other commission members in urging Congress to pass the legislation necessary to put the recommendations into effect.

As the most pressing problems of the airline industry today are financial, I'd like to stress the importance of the recommendations of the commission's Financial Working Group, on which I served. The recommendations include:

- Amending the Alternative Minimum Tax so that airlines and other capital-intensive industries are not forced to pay taxes at a time when they report losses. From 1990 to 1992, the airline industry lost \$10 billion yet paid \$670 million in AMT. Some airlines had to borrow money to pay taxes.
- Rolling back the ticket tax and cargo waybill tax to their pre-1990 levels of eight percent and five percent, respectively.
- Adopting policies that encourage a cooperative partnership between labor and management.
- Imposing an absolute limit of one year on the exclusive right of a bankrupt carrier to file a reorganization plan.

The government has to do its part in creating an economic climate that enables the industry to succeed. But management must realize that the problems that need to be addressed are too big to solve by just demanding employee concessions. The airline industry is labor-intensive, and motivated employees have a very positive influence on the bottom line. Only when management fully understands and adequately addresses labor's stake in corporate performance will it be possible to achieve full cooperation. And only then will we be able to create the best opportunity to restore financial stability to the airline industry. ➔

The airline industry is labor-intensive, and motivated employees have a very positive influence on the bottom line.

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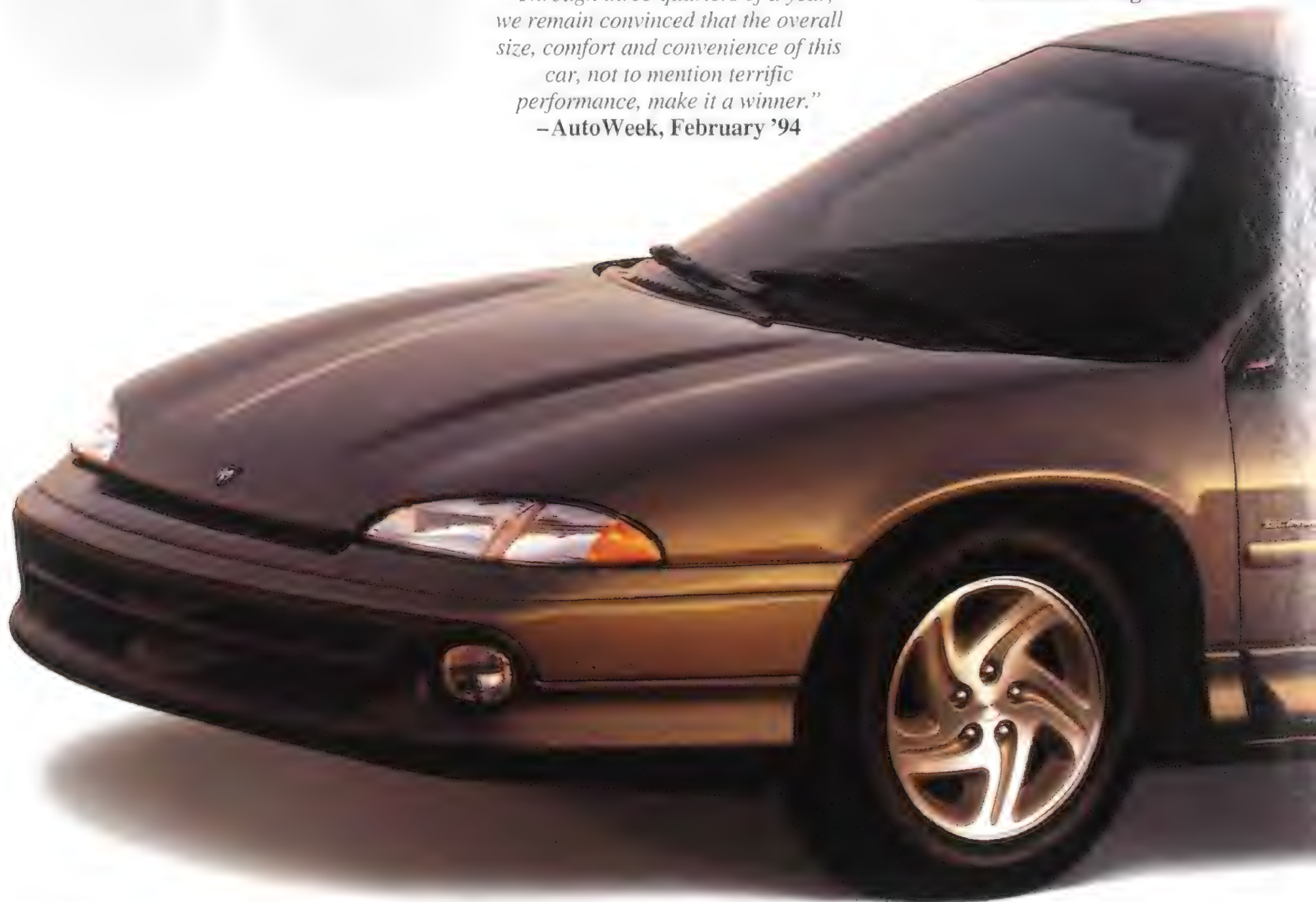
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WIND, SAND AND WARS

He was a writer and a flier, but by his own admission Antoine de Saint-Exupéry was no fighter. Still, he enlisted an American photojournalist to get him back into the war—an action that would cost him his life.



Grounded in World War II by his age, Antoine de Saint-Exupéry asked photojournalist John Phillips to help him get back on flying status.

Story and photographs
by John Phillips

On the morning of July 31, 1944, French pilot and author Antoine de Saint-Exupéry disappeared. He was flying his ninth reconnaissance mission, four more than had been authorized by General Ira Eaker, commander of the U.S. Eighth Air Force in England.

That morning, commanding officer Captain René Gavoille had known something the pilot didn't: Saint-Exupéry was to be grounded on his return. But he never returned. The circumstances leading to this last flight belong to a peculiar chain of events in which I regret having taken part.

Saint-Exupéry's airplane was never found, and his fate remains a mystery. A likely

theory is that, on his return from mapping the Grenoble-Annecy area in preparation for the Allied landings in the south of France, he flew over his mother's house on the Mediterranean coast and was shot down over the sea.

In 1992 a French champagne company underwrote an expedition to find Saint-Ex's P-38 Lightning. Nothing was left to chance in the highly orchestrated event, but the results were inconclusive. I have the nagging feeling that Saint-Ex never wanted to be found.

Saint-Exupéry and aviation were born about the same time and grew up together, united in a deep love. As a pilot, however, the man was an individualist no airline today would consider employing. But in the years when French commercial aviation was pioneering an airmail service to Latin America, he was one of the pioneers. He flew for Latécoère, a French airline with a grandiose vision and little capital. Latécoère pilots flew in biplanes that were slower than fast cars and whose ceilings were considerably lower than the peaks of the Andes they had to cross. Latécoère was the stuff of legend; Saint-Exupéry, its poet. He used words to bring sky to earth.

Saint-Exupéry came into my life on a July day in 1939 while I was in the Argentine. *Life* magazine had assigned me to photograph Cape Horn. The quickest route to the Horn was to fly from Buenos Aires to Rio Gallegos, Patagonia.

As I waited for my flight in the drafty lounge, I opened a book given to me the night before. "Isn't this a coincidence?" the giver had said; "I have just received a book from an old friend who pioneered the line you're about to fly." The book was *Terre des Hommes* by Antoine de Saint-Exupéry. This was the first I'd heard of the author and his now famous *Wind, Sand and Stars*, as the English language version was known.

In the harsh light of the lounge, I flicked through the pages until I noticed a stocky man staring at my book. He wore a leather jacket and a scarf around his neck.

"Saint-Ex was my boss," he said when our eyes met. "He was very strict. Once when I was flying south, I saw him make a forced landing. I too landed to find out what was wrong—we didn't carry radios in those days. He greeted me with an angry 'Rozés, I'm fining you 200 pesos to teach you the proper



By the time Saint-Exupéry was allowed to fly again, the Lockheed P-38 had replaced the Bloch 174s he had last flown for the military. Saint-Ex found that he had his hands full in mastering the sophisticated new fighter.

respect for the mail you carry!' According to Saint-Ex, I should have flown to my port of call, turned in the mail, and only then reported his position, instead of taking a chance myself to save him."

All this came back to me in February 1944. I was in Algiers on my way to the Italian front. Detained to await my travel orders there, I learned that Saint-Exupéry was in town. I called him at the friend's apartment where he lived.

"Major de Saint-Exupéry," I said, "we have an Argentine friend in common and I would very much like to meet you."

At first sight, he was little more than a silhouette against the window of an unlit room in the early winter dusk. In profile the nose of this 20th century Pico della Mirandola stood out with the mocking and insolent air that earned him the nickname of Pique la Lune.

Saint-Ex displayed little sign of the many crashes that had broken practically every bone in his body. His most memorable was one in Guatemala that had put him in a coma for eight days. "That crash," Saint-Ex would remark, "taught me all about gravity." One scar from this accident had raised an

eyebrow into a permanent inquisitive look, while another gave his face a wry grin.

When World War II broke out in 1939, Saint-Ex was a captain in France's II/33 reconnaissance squadron, a happy solution to his dilemma of wanting to participate in the war but do no killing. The Bloch 174 he then flew, with his usual attentiveness to thought and absentminded disregard for material details, was a three-seater that accommodated an observer and gunner.

As aviation matured, aircraft grew more powerful, but the same was not true of pilots. By the time Saint-Ex was about to fly again (his squadron, which had been disbanded after the 1940 armistice

with Germany, was reactivated after the Allies liberated North Africa in 1943), he and aviation were no longer contemporaries. In that three-year span, airplanes like the Lockheed P-38 Lightning had appeared, heralding the new age. Saint-Ex's squadron, now under U.S. command in Algeria, was equipped with these fast pursuit ships, in which cameras replaced observers. When he reported back to duty, Saint-Ex discovered that in this transformation only two members of 1940's II/33 squadron remained: Captain René Gavoille and himself. Regulations, however, soon caught up with him. At 43, he was well over the age limit of 35 for U.S. fighter pilots and, like the observers, had become obsolete. He was grounded, a fact he could not and would not accept.

In his husky voice and humorous way, Saint-Ex blamed an American colonel for the grounding, disregarding the fact that he had totally destroyed a P-38. "He was anti-French and simply took this unfortunate landing as a pretext. But you don't ground a man for that." The way he said "ground a man" gave the phrase a terrible implication.

I asked Saint-Ex if he was writing. "I can't," he said. "I have no right to say anything.

Only those who participate in the war have a right to speak." He shrugged his large shoulders and led me into the kitchen. There he prepared drinks: sweet muscatel mixed with a rough alcohol distilled from wine, a concoction he set on fire instead of shaking.

Back in the drawing room, Saint-Ex peered thoughtfully at his glass. At length he said, "Get me reinstated into my squadron and I'll donate what I write to your magazine." Unable to imagine Saint-Exupéry sitting in a dreary parlor while men were fighting, I promised to do what I could.

I happened to know Tex McCrary, a colonel on General Eaker's staff. Eaker, as commander of the Mediterranean Allied Air Force, had the authority to grant Saint-Exupéry's request. Conveniently, the general's headquarters were at Caserta, outside Naples, where I was heading.

I found Tex McCrary in Naples. He believed that if a man wanted to participate in a war, he should be allowed to, and agreed



Saint-Ex taught Phillips a word game that challenged player and teacher equally.

While scribbling clues, Saint-Ex would invariably doodle a rendition of Le Petit Prince. But as sharp as he was with words, Saint-Ex was easily distracted in the cockpit.

to speak to Eaker. At first the general was against the idea of sending into combat one of France's most distinguished writers, especially one who was well over age. He put off the decision. While awaiting the verdict, I flew back to Algiers.

In the hope of personally convincing Eaker, Saint-Ex followed me back to Italy, absent without leave as far as I could see. Helping him pack, I found that most of his belongings consisted of a huge pile of papers. Saint-Ex also owned three Parker pens of which he was inordinately fond. In a display of trust, he asked me to carry his inkwell.

In Naples, Saint-Ex moved into my billet, a luxurious apartment on the Vomero, where he rediscovered Kafka in the vast collection of books left by the apartment's owner. When not absorbed by *The Trial*, Saint-Ex produced his beloved chessmen and cheerfully beat me. Out on the town with no chessmen available, he produced scraps of paper he always carried either to work out improbable equations or play a word game. In either case, sooner or later the image of a child the world has come to know as *Le Petit Prince* would emerge on a corner of this compulsive doodler's piece of paper.

Finally we got to see Tex McCrary. I translated Saint-Ex's plea, pointing out his importance as a popular writer in the United States, where his *Flight to Arras* had been a Book of the Month Club selection, and how he could be useful to the war effort if he could only fly and write. We never did see General Eaker, but days later McCrary advised me that the general had cleared Saint-Ex for five missions with his old squadron.

To celebrate his return to the squadron, Saint-Ex invited members of the Third Photo Reconnaissance Unit to a barbecue, which consisted of two roast lambs and an ocean of wine. The barbecue ended in song, the Americans belting out "I've Been Working on the Railroad" and "Jimmy Crack Corn" and the French singing "*Boire un Petit Coup C'est Agréable*" and "*J'aime le Jambon et la Saucisse*," songs Saint-Ex told me dated back to the days of Louis XIII's lusty musketeers.

Saint-Ex's first mission kept us on tenterhooks. Captain Gavaille patiently fitted him into a heavy quilted high-altitude flying suit and fur-lined boots while Saint-Ex stood with arms outstretched, and sighing heavily. The act of easing himself into the P-38 cockpit was made all the more complicated by his cumbersome flying gear.



His return was no less suspenseful. For his incoming call, he used the previous day's code, "dress down, one, two." The control tower was suspicious; a fighter squadron and the anti-aircraft batteries were put on alert. The alert was called off only when an extremely loud and clear "Merde!" came through. The American officer in the tower, unable to pronounce "Saint-Exupéry," reported in a disgruntled tone, "Major X is

To celebrate his return to the squadron, Saint-Ex filled his P-38's reserve tank with wine in Algiers and flew it to the base for a party at which the well-refreshed guests doubled as entertainers.

coming in." When the P-38 appeared overhead, we all worried, including the ambulance driver who came roaring up, that Saint-Ex might just forget to lower his landing gear.

It was not only when Saint-Ex flew that I got palpitations. I also got them when he kept postponing writing. Like most authors, he went to work only when he had exhausted every pretext for not doing so.



The night he finally decided to write the piece he promised me, I readily agreed to stay up all night to keep him company.

Settling down, I noticed, was as exhausting for him as struggling into his flying clothes. Fitting his large body into a small, squeaky wicker chair, he pressed his feet together like a studious child, crouched over the writing pad on his lap, and scribbled neat rows of small characters that slanted hopefully up the page. Next to him lay a watch, at which he frequently glanced to check his progress, as though it were an indicator on an airplane's instrument panel.

The wicker chair creaked. "Funny," he remarked, rubbing his wrist. "It only hurts when I write legibly." He wiggled his fingers, lit a cigarette, and looked at his watch before returning to his small black characters.

"Isn't it remarkable?" he said. "When I fly my Lightning it is not so much that I travel, but that all places come together. I breathe oxygen from New York in the sky of France."

The chair creaked again as Saint-Ex stood up. "I've finished," he said. After going over the manuscript, we went outside to get some air, standing on the terrace of the large villa overlooking the Mediterranean. It was chilly, and Saint-Ex shivered slightly. With his hands in his pockets, he looked out toward the horizon, behind which lay France, where he would reconnoiter the next day.

We said goodbye when I left that morning. I watched him stroll across the terrace and disappear into his room, and I suddenly felt sad, though I did not know then I would never see him again. —

Saint-Exupéry never returned from his ninth mission, a photo-reconnaissance flight over Grenoble. A 1992 search of the Mediterranean was inconclusive.

Letter to an American, written on May 29, 1944, was a testimony to the spirit of American soldiers. In 1985 John Phillips presented Saint-Exupéry's original manuscript to the Bibliothèque National in Paris.



PASSAGE TO VIETNAM

Photo by Joy Dickman



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The people behind a
unique design concept
believe that everything
hinges on the wing.

Spratt, Schmittle, and Freewing

by Ed Regis



Freebird

After an inauspicious debut over 90 years ago, the free-wing design has been resurrected in the Freebird MK-5, a two-seat airplane said to resist stalls and dampen turbulence like no other.

Hard to believe, after 90 years of flying them, that the airplane is all wrong, specifically the wing, more specifically its fixed position with respect to the fuselage. After all, why does the whole aircraft have to be angled up or down just because the wing needs to be pointed that way? Why do passengers have to be slanted toward the ground—coffee cups and beer cans rolling down the aisles—merely because the airplane is descending to land?

And why should passengers be slammed with every last blast of turbulence merely because the wing is bolted stiffly to the fuselage? Why not unbolt it? If you attached it instead with a hinge, so that the wing could rotate freely around the spanwise axis, like the slats of a venetian blind, then it could angle into updrafts and downdrafts automatically, spilling them out, sliding right through them almost as if they didn't exist.

And think of the safety benefits: a free-castering wing, if properly built, cannot be stalled. A fixed-wing aircraft stalls because the angle of attack (the angle between the wing chord and the relative wind) increases beyond the wing's ability to provide lift. With a freely tiltable wing, the angle of attack remains constant; the wing always meets the wind at the same angle. Which means that it will never stall.

So here we have this magical new

wing, one that neutralizes turbulence and resists stalls—automatically, with no input from the pilot. It's enough to make you wonder why airplanes haven't always been built this way. It's enough to make you wonder, in fact, whether you couldn't acquire rights to the concept, then sell it to everyone from Cessna to Boeing. Conceivably, you could make a fortune.

Which is why, in 1987, Hugh Schmittle, an aircraft salesman, and Odile Legeay, an international banking executive, founded the Freewing Aircraft Corporation.

Hugh Schmittle was never one of your junior-pilot types.

"Flying was not a lifelong dream," he says. "I always liked airplanes, but it was not a case where I ate, slept, and breathed airplanes from the time I was three. I was a late bloomer."

Forty-five years old, bearded, and slightly paunchy, he still hasn't gotten his private license, although he's been trying for years. "I discovered a long time ago," he says, "that if you want *not* to fly, then start an airplane company. You don't have time for things like that."

His grand entrance into aviation came only after he quit grad school. He was on his way toward a Ph.D. in philosophy at the University of Illinois, where he taught for a while, when he was ap-



prised of a rather alarming statistic: only three percent of applicants for academic jobs were hired in any given year. "I decided to bail out and get a real job," he says.

He became an investigator for a federal strike force probing organized-crime infiltration of the Teamsters union. Shortly thereafter—because there had to be more to life than this—he took up hang gliding. "I got all kinds of literature," says Schmittle. "I read up on everything that was being made at that time, and I ended up buying one of the first powered hang gliders, a foot-launched thing with a 32-foot wooden wing. I ordered it as a kit from a guy in California, Craig Catto."

That was in 1976. By the time the kit arrived some six months later, Schmittle had learned about a wholly new concept for controlled flight. His friend, Bill Frank, a longtime member of the



CAMERON DAVIDSON (3)

Hugh Schmittle and Odile Legeay (left) founded Freewing in 1987. No longer a fledgling, the company has seven employees and access to the University of Maryland's wind tunnel, where technician Jon Ballentine conducts tests on a drone (above).



Experimental Aircraft Association, had pointed out a long two-part article that had appeared in *Sport Aviation* a couple of years earlier. "The Controlwing Aircraft," by George G. Spratt, described a free-floating wing design that had absolutely fantastic performance characteristics. Theoretically, it virtually eliminated turbulence while at the same time was inherently unstallable.

"Floating wings can tilt as required

to spill the gusts regardless of their duration," Spratt wrote. "The advantages of an aircraft that will not stall or spin are too obvious to dwell upon."

It sounded too good to be true, but Spratt had buttressed his argument with all manner of facts, figures, diagrams, and pictures, and it made an impressive case.

Well, thought Schmittle, *why not a free-wing ultralight?* So he and Bill Frank

set about converting the mail-order hang glider into a free-wing version. They worked nights and weekends for over two years, and in the end they came up with a product that had a rather unfortunate drawback for a prototype flying machine: no matter what they did, it would not leave the ground. This was depressing.

But Schmittle, with his years of philosophical training, was accustomed to seeing beyond surface appearances to underlying realities, and to him the floating-wing theory still appeared correct. He was also enough of an independent thinker to imagine that he could pick up on his own whatever practical experience and lore were necessary to design and build a free-wing craft that actually flew. So he abandoned the kit conversion as an unflyable kluge, sent away for books and articles about aeronautical engineering and construction, and became a world expert on the free-floating wing.

A few years later he'd designed and built, from scratch, a wholly new ultralight, the Freebird Mark I. He took it out to Ridgely-Pelican, a grass field on Maryland's Eastern shore where he used to skydive, and discovered that this new craft took to the air quite naturally. So exceptionally stable and forgiving was it, in fact, that Schmittle used it to teach himself to fly. "Which is a testament to the stability of the concept," he says, "and certainly not to any piloting skills I had."

By this time it was 1984, and Schmittle was a regional sales manager for Aérospatiale, the French conglomerate that manufactures everything from light aircraft to Airbus airliners. He'd also started his own company in Maryland—Schmittle Aircraft—to make and market the Freebird. He took the Mark I down to Sun 'n' Fun, in Lakeland, Florida, a gigantic EAA fly-in, for his big demonstration, product launch, and introductory marketing salvo.

Where, unfortunately, everybody thought the craft was a "trike," a Rogallo-wing hang glider that was rapidly becoming passé. "I told them, 'No you don't understand,'" says Schmittle, "this is a revolutionary concept. It's a free wing but it *looks* like a trike.' But it just became impossible to get people to see past that to the underlying



CAMERON DAVIDSON

ing aerodynamics.”

And even when he explained it to them, even after they’d warmed up to the idea and actually begun to see the point of a free wing, there was always this residual skepticism, an attitude of “Yeah, well, look, if this is so good, if it really does all this great stuff, then how come nobody’s ever tried it before? How come every plane in the sky has a pair of fixed wings?”

It was regular as the sunrise, that objection.

“There’s got to be some problem with it, you know? I mean, there must be. Otherwise somebody would have done it by now, right?”

Schmittle lost a lot of money on the Freebird and swore he “would never start a company again.”

The George G. Spratt who wrote the *Sport Aviation* piece about the controlwing comes from a long line of George Spratts. In his white clapboard home in Connecticut, which looks out across Long Island Sound, hangs an oil painting of one his ancestors, who’s also named George Spratt. Spratt’s father and son are both named George Spratt, and not one of these men knows if he’s George Spratt the third, fourth, or ninth; consequently, they distinguish themselves by initials. This is George G. Spratt, his father was George A., his father was George R., and so on.

Spratts A. and G., it turns out, were two of the main pioneers of the free wing, the third being Octave Chanute, the so-called father of aviation. If there’s

The MK-5’s pivot-wing design is a real departure, but its overall appearance is not. The same goes for the cockpit controls, which have been designed to look and handle like those of a fixed-wing craft.

one thing that all three men would have agreed upon, it’s that the fate of the free wing was essentially sealed back in October of 1902, when an “oscillating wing” glider was brought to Kitty Hawk, North Carolina, and delivered to the Wright brothers. The glider, which had wings that tilted around the lateral axis, had been built at Chanute’s behest by one Charles H. Lamson, who lived in Long Beach, California.

Chanute, a French-born civil engineer then based in Chicago, had been thinking about flight and building gliders even before the Wright brothers got interested in the subject, and one of his pet theories was the concept of automatic stability. If the wings were left free to rotate about one or another axis, he thought, they would automatically compensate for sudden gusts. Chanute also believed that the problem of stability should be solved before powered flight was ever attempted—which is the reverse of the way things actually turned out.

Between 1896 and 1898 Chanute built a series of movable-wing gliders and flew them on the shores of Lake Michigan. Later, while vacationing in Pasadena, Chanute met Lamson, a kite maker who’d recently patented an oscillating-

wing kite. Chanute asked Lamson to build a glider that incorporated the idea, and this was the craft delivered to the Wrights.

Orville oversaw the flight testing of the oscillating-wing machine on October 13, 1902. On the beach witnessing the event were both Chanute and George A. Spratt, father of George G.

George A. Spratt was a retired physician from Coatesville, Pennsylvania, who’d long had an interest in birds and flying. In 1899 he’d written a letter to *Scientific American*, the premier science magazine of the age, inquiring about the prospects of heavier-than-air flight. The answer (later framed and installed over George G.’s desk) was: “We cannot advise you to pursue the subject of aerial flight, there is little promise in it. We do not know of anyone who would be likely to take an interest in flying machines.” Not overly impressed by this, Spratt built and tested various airfoils in a homemade wind tunnel, and with these “experiments before the fan” (as he called them) investigated such arcane phenomena as “travel of the center of pressure” and other effects, concluding, along with Chanute, that the stability problem could be solved by the use of a “rocking” wing.

As both Spratt and Chanute watched from the sidelines, the oscillating-wing glider loomed over the Kitty Hawk sand dunes, first as an unmanned kite, then with Chanute’s test pilot, Augustus M. Herring, aboard. While Herring’s glide was some 50 feet in length, Orville and Wilbur were making glides of well over

500 feet in their own machine.

Herring was to fly the glider again the next day, but for unknown reasons he decided not to...and at that pregnant and fateful juncture it passes out of aviation history. The Wrights dismantled the machine, which Chanute had given them as a gift, and stored it in their camp building, where it lay for the next several years, until in the winter of 1908 a storm carried away the roof of the building and destroyed the glider. By then the Wrights had conquered the air in a series of fixed-wing craft, and this, in the view of free-wing enthusiasts, explains why all of today's planes have fixed wings: nothing succeeds like success.

According to free-wingers, however, that success was decidedly mixed. With fixed wings and with control surfaces that could raise the nose of the aircraft to unnatural angles, the Wright Flyers were easily stallable. Indeed, Wilbur stalled his own glider about three weeks before the test of the oscillating-wing glider. As he described it: "[The plane] reared up as though bent on a mad attempt to pierce the heavens. But after a moment it...slowed up till it came almost to a stop with the front of the machine still pointing heavenward. By this time I had recovered myself and reversed the rudder to its full extent, at the same time climbing upward toward the front so as to bring my weight to bear on the part that was too high. Under this heroic treatment the machine turned downward and soon began to gather headway again."

Stability, the Wrights thought, was the business not of the machine but of the pilot. "The remedy for the difficulty," said Wilbur, "lies in more skillful operation of the aeroplane." But as George G. Spratt commented many years later: "This decision has probably cost more lives than any other ever made in aircraft history."

By the time George A. Spratt died in 1934, he'd built a whole series of "rocking wing" flying machines. Some flew and some didn't, but it was his son, George G., born in 1904, who built the first practical versions of free-wing aircraft. All of them were characterized by automatic stability and great safety, and they were incredibly easy to fly—

"ridiculously easy," Spratt says today. He remembers the time he and a friend, Robert Quaintanze, were testing one of the free-wing flying boats on the Chesapeake Bay. "Robert knew nothing about aerodynamics," Spratt recalls, "but he knew the airplane very well mechanically. I was flying around one day and after I landed he said, 'Let me try it.' I thought he just wanted to taxi around a little bit and I said, 'Sure, get in and taxi around.' He took off and flew it for about 20 minutes. Came back and landed beside the boat."

Quaintanze, now a retired machinist

still living in Coatesville, had been in the air only once before in his life, as a passenger in a Piper J-3 Cub. Now, suddenly, "Here I was flying solo."

His biggest problem was locating Spratt's boat again, the *Quest III*, a 55-foot two-mast schooner, which they were using as their staging point. "I wasn't used to seeing down," Quaintanze says, "and I couldn't recognize boats from the air." There'd been fishermen out that day, though, and he realized that the small specks in the water must be fishing boats, and that the biggest speck of all must be the *Quest*

WEB BRYANT

The Freewing



As the aircraft moves forward through a steady wind, both wing and fuselage remain level (top). In a downdraft (middle) and an updraft (bottom), however, the wing moves while the fuselage remains level.

The key to the pivot wing's success is its hinges.

Because the wing is hinged, not bolted, to the fuselage, it can rotate freely about the spanwise axis, absorbing 75 percent of wind gusts and providing a much smoother ride.



CHAD SLATTERY/DO

III. So he aimed for that point and landed next to it.

The experience, he says, was proof of the free wing's stability: "The *airplane* knew how to fly, that was the main thing. *You* didn't have to know how to fly if the airplane did."

Spratt spent much of his life as an aeronautical engineer and designer for a few aircraft companies; for two of them he constructed some free-wing prototypes. In 1937 he built one for Bendix, but "the company's board decided against further development," Spratt says, "on the grounds that as a major supplier of aircraft components, they should not be building planes in competition with their customers."

Bendix ended up selling the craft for \$50. Then, in the mid-1940s, Spratt built a roadable version for Consolidated Vultee. It flew perfectly well, but roadables were never exactly major contenders in the aircraft market, and that airplane too soon went the way of all flesh.

Later, Spratt concentrated on flying boats, of which he built a number of free-wing editions with a view to possible manufacture and sale—perhaps as a kit—but mainly, as it turned out, for his own use and amusement. He flew them up and down the East Coast and all around Florida, putting in some 700 hours of flying time, all of it self-taught. To this day he's never had an hour's worth of flying instruction, nor

has he acquired a pilot's license.

In Spratt's view, the major aircraft manufacturers aren't going to be building free wings anytime soon—not that he hasn't tried to persuade them to. "Their response is 'Look, we have patents, we have drawings, we have two wings and a tail, and you're coming in here asking us to throw all that out and start all over again like we did a hundred years ago.'

"And you go out the door."

In 1983 Hugh Schmittle managed to track down George G. Spratt. He found him aboard the *Quest III*, which was tied up at the docks near Charlestown, Maryland, at the north end of the Chesapeake. The two hit it right off.

"Spratt has a heart of gold," says Schmittle. "He gave me all kinds of help, plus inspiration."

"He's a likable sort of guy," Spratt says of Schmittle. "He visited me aboard the *Quest III*, then I didn't hear another thing from him for a couple of years...until he decided he wanted to build some planes."

That decision came in the wake of a party thrown by Aérospatiale in Washington, at which Schmittle met Odile Legeay, senior vice president at Elite Yachts de France, in Annapolis. Shortly after they met, Schmittle converted Legeay to the free-wing religion, and she, for her part, convinced Schmittle



that maybe the idea had some business potential.

"Odile ran some numbers on it and put together a kind of 'What if?' model of the business," says Schmittle. "I computerized it so we could play the 'What if?' game a little more easily. But the bottom line was that this could work out as a company, and that it could work

Freewing's biggest money-maker is in the market of remotely piloted drones for aerial reconnaissance. Built to carry a 50-pound payload, the Scorpion Tilt-Body combines an engine that can change the direction of its thrust (top) with a pivot wing (bottom), enabling it to cruise at 170 mph or hover.

extremely well."

So in 1987 the two founded the Free-wing Aircraft Corporation. All they needed was money, offices, employees, and customers, roughly in that order. "We decided that I would go back to France," says Legeay. "At that time we were thinking of light aircraft, and ultralights were a very active business over there." Schmittle, meanwhile, would try to drum up business in the States.

In 1988, while working at a bank in Lyons, what should come across Legeay's desk but a copy of *Maryland News*, a newsletter published by the European office of the state of Maryland. Inside was a story headed "A Maryland Technology Advancement Programme," describing the University of Maryland's "business incubator" initiative, which furnished startup high-tech companies with "offices, laboratories, manufacturing facilities, secretarial and receptionist services, access to computer resources and the university's library and specialized services, and also business support."

Six months later, Freewing Aircraft had been admitted to the state program, giving the company a university affiliation and address, plus some much-needed credibility, not to mention grants that eventually reached \$500,000. Still, Schmittle and Legeay took no salary, and so to make ends meet each worked

nights and weekends, she doing translations, he typing legal briefs for law firms and playing piano for blues bands.

But the company now had a formal base of operations—some prefabricated buildings on the edge of the College Park campus, near the university's wind tunnel—and a couple of employees. Soon they were testing new airfoils and free-wing models and building a succession of full-scale prototypes. When these new Freebirds were flight tested, they worked as advertised, dumping about 75 percent of inflight turbulence and never even thinking about stalling. Otherwise there was no one element common to them all: as Schmittle is quick to point out, the free wing is not an aircraft but a type.

There is, for example, no one way of controlling a free wing. George G. Spratt's "controlwing" flying boats were controlled by the wings themselves, hence the name. You banked by turning a steering wheel that tilted the two wing halves in opposite directions, one up, one down. There was no "pitch control" to speak of; you added power to climb, reduced it to descend. It was an aircraft

that took off, flew, and landed at the same speed—which was a function of whatever powerplant happened to be installed.

Schmittle's MK-5, by contrast, has a single straight-through wing and a three-axis control system based on elevons—hinged panels mounted at the wing's trailing edge that can be slanted up or down. Left-right movement of the stick produces differential movement of the elevons, causing the airplane to bank. Pulling back on the stick deflects both elevons upward; this causes the wing to rotate to a higher angle of attack, increasing lift. (The new angle of attack will remain constant for as long as the elevons are held in the new position. In no case can the elevons raise the wing to a stalling angle.) Conversely, pushing forward on the stick slants the elevons downward, lowering the angle of attack. (In a free wing, as in a conventional airplane, power controls altitude, stick controls airspeed.)

"The plane's going to handle pretty much as a fixed-wing airplane does," says Schmittle. "We laid out the cockpit of the MK-5 to be transparent to the conventional pilot." Indeed, other than the smoother ride and the fact that you can't stall or loop a free-wing craft, the ordinary fixed-wing pilot will be aware of few differences as far as the flying goes.

Burt Rutan (left), who helped design the Scorpion, and his employees get the drone ready for its next flight in California's Mojave desert.



Except, that is, for the matter of flaps. For various technical reasons, free wings do not take willingly to flaps, which means that approach and landing speeds are higher, and glide paths shallower, than in an airplane with conventional flaps. Free-wing buffs, however, have come up with ingenious ways of compensating for this deficiency. Spratt's controlwing incorporated a "collective pitch lever," which, when yanked, momentarily forced the wings up to a higher angle, increasing lift and slowing the craft, just as if it had flaps.

Freewing's own MK-5, on the other hand, incorporates a device that temporarily changes the craft back into a conventional airplane: a lockable wing.

A lockable free wing?

Exactly: at the pilot's option, the Freebird MK-5 can be turned into an ordinary fixed-wing aircraft for approach and landing.

Naturally, there are reasons for this. Any airplane is a string of compromises, a bunch of engineering trade-offs flying in close formation. The free wing is no exception, and so it does not, in the end, give you something for nothing. You gain stall resistance, true enough, but only at the price of sacrificing the ability to land fully stalled.

A locked free wing, although strictly speaking a contradiction in terms, does confer the primary benefits of a normal fixed wing: it allows for use of flaps, a slow and steep approach, and the customary full-stall landing. On the other hand, a locked free wing erases one of the main advantages of free-wing aircraft—stall resistance—in the very flight regime, approach and landing, where stalls are most likely to occur.

Recently, however, Schmittle invented a way of dispensing with the locked wing while retaining some of its benefits. His idea was to convert the wing into an air brake, a veritable barn door, immediately upon touchdown. The pilot would make a typical free-wing approach—which is to say at a slightly

higher speed, and at a slightly shallower angle, than a fixed-wing craft would make—and then, at the moment of touchdown, would deflect both elevons to an extreme downward position, thereby forcing the wing to assume a steep nose-down angle. Lo and behold, the same airfoil that previously provided lift is now transformed into a massive wall of drag.

"Not only does this slow the aircraft pretty dramatically," says Schmittle, "it

and so forth. I don't see why it hasn't been more readily accepted for smaller aircraft."

"It appears that it would have some potential for stall prevention," says Paul Stough, who was project engineer on NASA's General Aviation Stall-Spin Program, conducted at the Langley Research Center in Hampton, Virginia, between 1973 and 1989.

Still, both experts voice some doubts about the free wing, especially regarding its use on aircraft of larger size.

"If you have a lot of inertia in the wing, maybe you could get into a situation in which you *could* stall the wing," says Stough. "And then what happens? Does it drop back to a lower angle of attack and everything's hunky-dory? I don't know."

"You have so much more mass in larger aircraft," says Thurston. "And if you don't get your balance points just right, then if that mass starts to move you aren't going to [be able to] stop it the way you can

with a control stick in little airplanes.

"But I really don't know what all the problems are," he adds. "I've never flown it so I can't tell you."

Indeed, the major problem with the free wing is not so much that it has limitations—any wing does—but that the very concept, including its pluses and minuses, is all but unknown in the aviation community.

"I've never heard of it," says Eugene Covert, professor of aeronautics and astronautics at MIT and former head of the department. "I don't know a thing about it."

"We have not really considered it," says Dennis Dungan, chief of advanced design at Cessna Aircraft in Wichita, Kansas. "I've read about the wing and the pros and cons of it, and I guess the biggest problem in implementing it in a practical manner would be problems posed by flutter and vibration, both of which would be excited by turbulence. But to tell you the truth we haven't



COURTESY GEORGE G. SPRATT

In the 1940s, aircraft designer George G. Spratt (right), assisted by two fellow employees, oversaw the flight testing of the Convair 103 control-wing, a distant relative of today's pivot-wing aircraft. Spratt, 90, now lives in Connecticut on the shore of Long Island Sound, where he is building a control-wing ultralight (opposite). Still fond of taking to the air, he'll test fly it himself.

also plants it solidly on the ground, which increases the effectiveness of the wheel brakes."

In the spring of 1994, Schmittle applied for a patent on the invention.

So is this miracle wing really all it's cracked up to be?

"I don't understand why it hasn't been accepted more than it has been," says David B. Thurston, an aeronautical engineer and author of *Design for Flying*. "It has advantages in gust alleviation

worked on it. I only know what I've read."

Schmittle and Legeay aim to change all that. Recently, they've had some major successes, and when in 1992 the company floated an initial stock offering, they raked in \$1.5 million, including a \$600,000 investment from the Brazilian firm Avibras Aeroespacial. They got some expert help in wing design when John Roncz, the aerodynamicist who'd done wings for Burt Rutan, produced a new set of airfoils for Freewing—and wound up purchasing stock in the company. Finally, Burt Rutan himself got involved, building scale models, then a full-size version of Freewing's UAV, or unmanned aerial vehicle, a tilt-body craft whose fuselage can be tilted up or down.

By any standard, the performance of these UAVs is surreal: by the judicious use of thrust-vectoring, the aircraft can essentially stop dead in the air and then

transition again to level flight. The potential military and civilian market for these tilt-body UAVs is so large—for border patrols, power line inspections, and the like—that in 1993 the company changed its name to Freewing Aerial Robotics. According to Schmittle, the name change does not signal a backing away from the notion that the free wing has a realistic application in the passenger market. "Absolutely not," he says. "It has always been our plan to develop both manned and unmanned airplanes and see which hits first. The Gulf war created a window of opportunity for UAVs—suddenly no commander wants to go to war without them. Our tilt-body has such spectacular performance, it truly does, that nobody can match it. There's relatively no product liability with UAVs, so the plan is to develop them first and later branch out into manned airplanes."

In June 1994, Schmittle and Legeay

announced a partnership between Freewing and the French firm Matra Défense, which will jointly produce a new ship-based UAV. Whether Freewing can do as well with passenger aircraft is another question.

George G. Spratt, principal optimist of the free-wing contingent, thinks they can. "I think there's a good chance of it," he says. "The free wing's coming. It's the proper way to build an airplane."

The hull of Spratt's flying boat, meanwhile, rests peacefully at the rear of his house. Facing out toward the water, nose up, its 85-horsepower Mercury outboard covered tightly with blue plastic, the craft has definitely seen better days. But at age 90, George G. Spratt still has some vague hopes—dreams, really—of one day putting the thing back in the water, firing it up, and once again free-winging it out over the Sound.

Whatever else happens, at least it won't stall. —



Personal Effects

by Frank Kuznik

John Young brought a corned beef sandwich. Gus Grissom carried some dimes. Alan Shepard took along golf balls. And then there were the 159-year-old socks...

T

wo years ago Gene Roddenberry finally made it into space, when he was blasted into orbit aboard the space shuttle *Columbia* in October 1992. It was fitting that Roddenberry, the creator of TV's "Star Trek," should make a space voyage of his own. The one drawback: he was dead. Only a small vial of his ashes actually made the journey.

When Roddenberry's mission was disclosed, even NASA insiders were surprised. The space agency has strict rules about nonessential cargo, and they are rarely bent for sentiment or entertainment. According to NASA spokesman Ed Campion, it took administrator Dan Goldin to give final approval for Roddenberry's flight, after Roddenberry's widow, Majel Barrett (who played Nurse Chapel on the original series), had spent a year lobbying for it. "After a lot of maneuvering and a lot of talking and a lot of everything, all I kept getting was 'No, we can't do it,'" Barrett says. "Then one day out of the clear blue sky I got a telephone call saying, 'They'll take it up on the next flight.'"

The event would probably still be a secret had Barrett not badgered Goldin into letting her talk about it. "They brought me to Washington and gave me a plaque with Gene's ashes and everything, but asked me not to say anything because somebody in Congress might get upset," she says. "Finally, when I was scheduled to speak at the Space Congress [in May 1994], I called Dan and said, 'Isn't it time now?' He said, 'Well, go ahead and break it, but do it quietly.'"

Spokesperson Campion is quick to point out that Roddenberry's posthumous flight was an "extremely unique and

Illustrations by Richard Thompson

special event" and that similar requests will not be considered. NASA's reticence about the flight is understandable: a trip into space acts like a modern-day philosopher's stone, transforming even the most mundane object into something rare and special. In the past, the agency has exploited this phenomenon by flying objects of historic interest, or memorabilia for employees and politicians. In the marketplace, a spaceflight can almost literally turn an object into gold: the price tag for space collectibles is often in the thousands. While Roddenberry's remains aren't likely to be put up for sale, the specter of the space program being used for commercial gain is one that still haunts NASA.

"Flown items are the Holy Grail of the space collectibles market," says Bill Miller, chairman of Odyssey Group, Inc. of Corona, California. "Whether it's a pocketknife or a urine collection device or flags or stamp covers, the ultimate space collectible is one that has flown with an astronaut on a particular mission." An auction Odyssey held last February included such paraphernalia as a Hasselblad camera flown aboard Wally Schirra's Mercury mission, a tie tack and sunglasses flown on Apollo 7, one of the dimes Gus Grissom carried on his Mercury flight, and a wealth of flags, patches, medallions, and personal items such as watches and pens from Gemini and Apollo flights. Among the items sold at an auction run by Superior Auction Galleries of Beverly Hills in June were stamp covers flown on Apollo 11, a pair of gold earrings flown on Apollo 12, and state and foreign flags flown on Apollo 16. The Apollo 11 stamp covers—each autographed by all three crew members—sold for \$27,000.

The demand for space memorabilia drops steeply beginning with the shuttle flights, partly because so many objects have flown aboard the shuttle and partly because the glamour is missing. "Up through



Apollo, you can pretty much name most of the astronauts, who were like the old-time cowboys," says Miller. "After that, interest drops off in the space program in general."

NASA has also tightened its regulations on what items it will allow in space. Today, the bulk of what goes along in the Official Flight Kit (OFK) and astronauts' Personal Preference Kits (PPK) tends to be fairly predictable—patches, flags, decals, pins and other jewelry, pennants, and commemorative medallions. NASA uses the patches and flags, which are flown by the hundreds, as mementos for conscientious employees and contractors, and as gifts to members of Congress, foreign dignitaries, and other officials.

"We call them presentos," says Robert Parker, a former astronaut who is now NASA director of space operations utilization. "They're usually mounted on a plaque and given to some senator or representative or governor back home when you go to visit them." NASA has literally thousands of flown four-by-six-inch state, foreign, and U.S. flags stockpiled and ready to roll. The large numbers of such mementos also keep demand—and potential prices—down.

The rules regarding memorabilia on flights now run nine pages of stiff legalese. Each astronaut is limited to 20 items

in his or her PPK, with a maximum total weight of a pound and a half. Moreover, astronauts must sign an agreement stating that they will fly only the items they include in their PPKs, and that none of them will be sold or used for commercial purposes. This restricts what most can take to "the usual trash and trinkets for relatives," in the words of one former astronaut. Indeed, if anything stands out on the PPK lists—which must be submitted for approval 60 days prior to launch—it's the scarcity of personal mementos. Astronauts typically fly jewelry and other small keepsakes not for themselves but for their spouses, children, parents, close relatives, and friends. Says Kathryn Sullivan, a veteran of three shuttle flights, "Those slots are an allowance to offer

a memento as a nice gesture to the family and friends who have done a hell of a lot



"Until Apollo 15, the rules governing what astronauts could take on spaceflights were relatively loose."

of keeping you patched together while you're working hard to become an astronaut."

In the early days, when astronauts would often carry items like hand-lettered signs with them ("Beat Army" and "Beat Navy" were favorites), the rules governing what could be taken into space were relatively loose. "You had to make a list, so that [astronaut office chief] Deke Slayton and everybody could have it," says Al Bean, who joined the program in 1963. "But as long as it didn't get too heavy, you could carry lots of stuff. It wasn't a big deal." In fact, Bean is still waiting for someone to claim several religious relics he took on Apollo 12. "I took things for so many different people, when I got home I mostly didn't know who they were for," Bean says. "So I still have three tiny gold crosses, two small Pope Paul VI medals, and one Holy Bible on microfilm that belong to somebody who has never asked me for them."

Gus Grissom brought some dimes along with him on the second manned Mercury flight. "I had brought along two rolls of 50 dimes each to give to the children of friends, three



"On the Gemini 3 spacecraft, John Young brought a corned beef sandwich, offering it to a surprised Gus Grissom after he complained of being hungry."

one-dollar bills, some small models of the capsule and two sets of pilot's wings," Grissom later wrote in an account of his flight and his near-drowning after splashdown. "These were all adding weight that I could have done without." Several of the dimes are now on display at the Astronaut Hall of Fame in Titusville, Florida.

On the Gemini 3 spacecraft, John Young brought a corned beef sandwich, offering it to a surprised Grissom after he complained about being hungry. But the real culprit was Wally Schirra. "I catered that," Schirra admits with a laugh.

"I got the sandwich at Wolfie's, a deli near the Cape, the day before. It was refrigerated all night so it was perfectly safe; we ate that food all the time." Still NASA was hammered about the unauthorized sandwich in subsequent appropriations hearings, during which one congressman called it "disgusting."

On the Apollo 14 mission to the moon, Alan Shepard had official clearance to take a couple of golf balls and the head of a six-iron, which he attached to a geology tool handle for some quick lunar golf. The enduring controversy is over the distance he attained. By his own admission, his first shot got "more dirt than ball." The second appeared to go a couple of hundred yards, but Shepard yelled, "There it goes! Miles and miles and miles!"

Things got more serious after the next Apollo mission, when Dave Scott, Al Worden, and the late Jim Irwin took 400 unauthorized first-day stamp covers with them to the moon. Those were not the first stamps to fly, nor the last; thousands have since been taken along for the Postal Service on shuttle flights. The difference was, the stamps from Apollo 15 were sold, violating a then unwritten prohibition against turning a profit on flown memorabilia.

"The guys were approached by a German in the philatelic business who made a deal with them to fly the envelopes, with the understanding that they wouldn't be sold until the Apollo program was over," says Irwin's widow Maryellen. "The money was to go for our children's education. But within weeks of the flight he welshed on the deal and began to release them."

None of the three men flew again. NASA confiscated the envelopes but was later forced to return them after Worden filed suit. Scott, for one, still professes to be puzzled by the furor they caused. "People had been taking along all sorts of things," he says. "The envelopes were sitting in the crew room when we went out for the launch, in full view of everybody. In fact, the astronaut office had them vacuum-packed and sealed. The people who were supposed to log them in just missed them."

Some of the covers have begun to appear on the market. Irwin left 25 to High Flight, the ministry he founded, which in turn has sold some to the German dealer. Maryellen Irwin says the dealer resold one recently for \$10,000. "It's pretty amazing," she says of the boom in space collectibles. "At the last auction they bought Jim's passport, his military ID, and some things that were just standard NASA issue, like his toothbrush and spoons. What really surprised me was when the auction house asked if I had any of Jim's canceled checks, because they have his autograph."

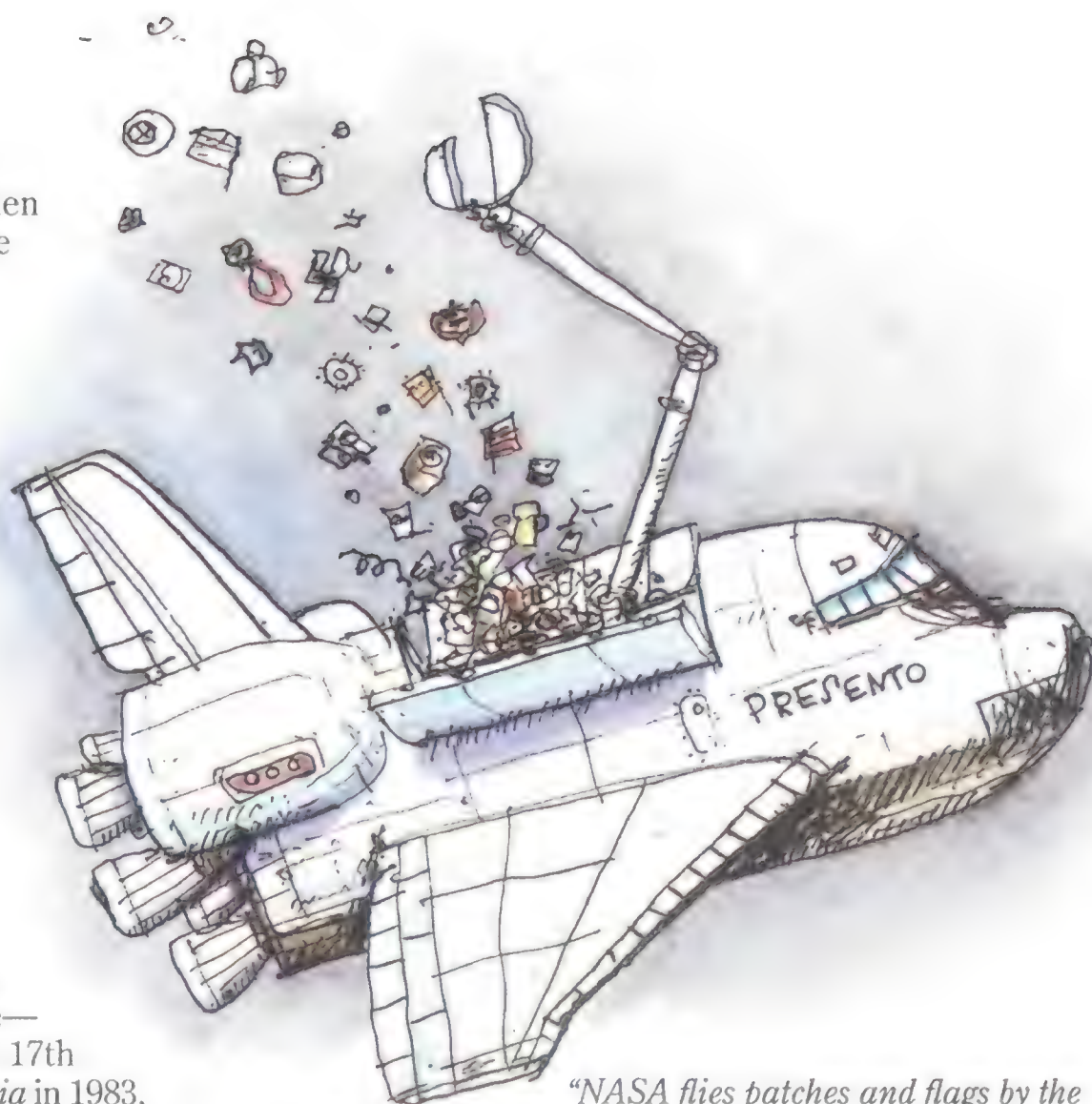
"I was quite surprised at the level of enthusiasm for some of that stuff," says Schirra. "Different things that the Smithsonian didn't want—like the Randle knife that I flew on Mercury, which had sat on a shelf for years, and some extra medallions I had, and a lot of autographed material that they get excited about."

Occasionally NASA will go beyond pins and flags, as Joe Allen discovered after a flight aboard *Columbia*. "Just by coincidence, I learned that a pair of spurs owned by Presi-

dent Reagan were carried on the flight," Allen says. "I happened to be in the presence of the NASA administrator who presented them. I remember it because, number one, I thought it was a rather odd item to have aboard a spaceship. And number two, in presenting them, the administrator said, 'Mr. President, here are your spurs, which flew aboard STS-7 with the famous American astronaut Dr. Sally Ride.' I thought that was funny, because the commander of that flight, Rick Hauck, was standing right beside me, and his name wasn't even mentioned. I looked at Rick and he looked back at me and sort of shrugged his shoulders, like 'Well, that's show business.'"

All manner of historical memorabilia have also gone along on spaceflights to create a symbolic melding of past and future. A piece of fabric from the Wright brothers' original *Flyer* flew aboard Apollo 11, an astrolabe—an astronomical device built in Persia in the 17th century—flew with Bob Parker aboard *Columbia* in 1983, and a wooden fragment of the sternpost from Captain James Cook's *Endeavour* was carried in the Apollo 15 lunar module of the same name. When Kathryn Sullivan, who had been an exchange student at the University of Bergen in Norway, flew aboard *Challenger* in 1984, she brought along a marked stick apparently used to log traffic in the port of Bergen a thousand years ago.

On his spaceflight in 1990, mission specialist and Cornell University alumnus G. David Low took along a pair of tan silk socks worn by university founder Ezra Cornell on his wedding day in 1831. Story Musgrave flew a small piece of Stonehenge, loaned to him by a British curator, aboard the



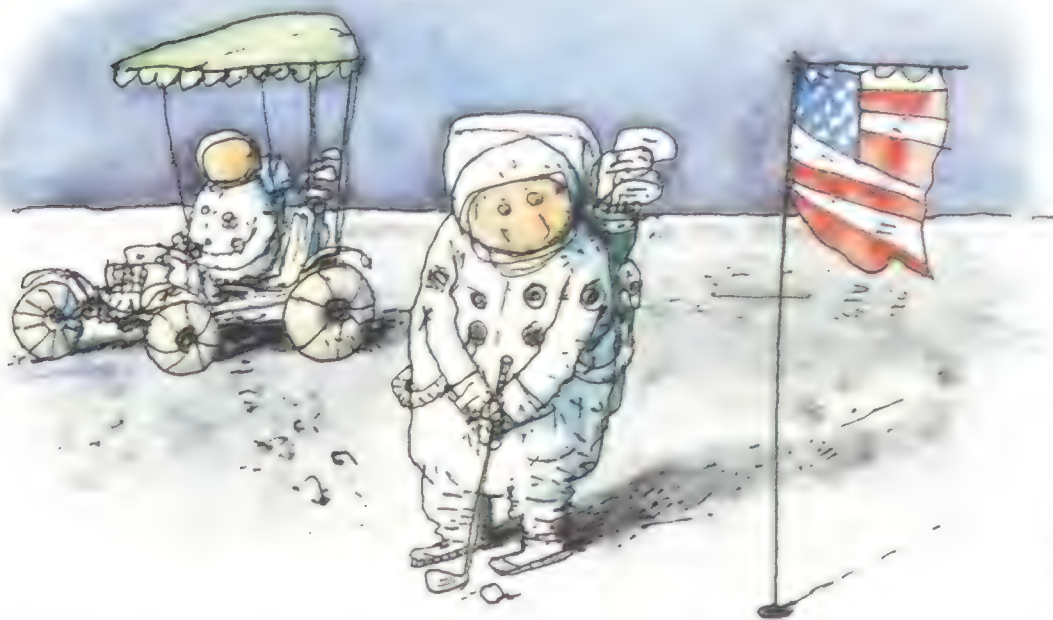
"NASA flies patches and flags by the hundreds as mementos for conscientious employees and contractors, and as gifts to members of Congress, foreign dignitaries, and other officials."

shuttle, and Ed Mitchell flew the four-star insignia of General Omar Bradley aboard Apollo 14. And Dan Brandenstein took along a doorknob from the state capitol building in Madison, Wisconsin, on a shuttle flight. "They were restoring the building, and the governor, Anthony Earl, asked me to fly one of the original brass doorknobs," Brandenstein says. "It was sort of oblong with engravings on it, very ornate."

And what became of the doorknob after he gave it back? "I personally don't have a clue."


An entire book could probably be filled with lists of items that NASA has refused to fly. "A guy selling automobiles in Atlanta wanted to fly a package of his business cards to give out to his customers," remembers Henry Clements, former associate director of Johnson Space Center. "Business cards were a popular item—we would get that kind of thing all the time. But anytime we could see a commercial purpose, that never happened."

Until the unlikely event that NASA changes its policy, space memorabilia collectors will have to content themselves with what becomes available on the auction circuit. For the more adventurous, there's at least one item just waiting to be picked up. On Apollo 16, John Young was carrying a tie tack for Dotty Duke, who intended to surprise her astronaut husband Charlie with it when he got back. But Young lost it. "It was in John's pocket and somehow fell out," Charlie Duke says. "So it's up there on the moon somewhere." Any truly devoted collector can find it someplace in the Descartes highlands. ➔



"On the Apollo 14 mission, Alan Shepard had official clearance to take a couple of golf balls and the head of a six-iron, which he attached to a geology tool handle."

Orion the Hunter



With ears that can hear through polar ice and Arctic seas, the Lockheed P-3 was born to catch submarines. Lately, though, the pickings have been slim.

by Carl Hoffman

Photographs by Ann Parks Hawthorne

Two hours into the mission, three-quarters of the P-3's crew are fast asleep.

Tactical coordinator Kenneth Crowe, a bright-eyed, kindly man of 29, droops behind the flight station.

Past Crowe is sensor three, Courtice "Wingnut" Wilkenson, a babyfaced 22-year-old whose head rests on his radar's control panel.

Across the aisle lie Edward Robertson, 31, and Mark Fish, 28, sensors one and two, snoozing to the rhythmic strains of reggae cranking from a portable compact disc player. Heaped with parkas



and snow pants, they could be a couple of homeless guys asleep on a bus.

On the floor next to a rack of buoys are ordnance man Wes Maynor, 39, and inflight technician Jim Nuyen, 36. It's cold in this part of the aircraft, especially 25,000 feet above the Greenland ice cap, so Maynor and Nuyen have encased themselves in fur-trimmed hoods, mittens, and felt-lined Sorel boots.

Behind them, in the P-3's only proper bunks, sleep pilot number three, Jay Huck, 26, and flight engineer Lou Arzola, 32.

Its slumber to the contrary, the crew

is anything but lazy. In one hour, the 12 men of U.S. Navy Combat Wing Five, Patrol Squadron Eleven, Crew Six, will be asked to find, pinpoint, and simulate killing a \$1 billion nuclear-powered attack submarine hidden beneath unknown fathoms of water and six to 10 feet of polar ice. They will carry out their training mission in a loud, old, worn, relatively cheap Lockheed P-3C Orion turboprop flying at 220 mph 200 feet above the ice in air so turbulent that it feels like we could be in an old pickup truck on a rutted dirt road. The 14-hour mission will blend teamwork,

oceanography, endurance, nearly acrobatic flying, chess-like strategy, and plenty of luck. It may also be one of the last of its kind.

And in this, the mother of all video games, you sleep when you can.

Crew Six finished breakfast at midnight. At 0030, showered, shaved, and dressed in green flightsuits, they

A submarine lurks somewhere beneath the Arctic ice. It's up to the crew of this P-3 to find it.



split up. Flight engineers Kenny Bearden, Lou Arrozola, Jim Nuyen, and Wes Maynor jumped in an Air Force pick-up truck and headed for the flightline, where the temperature was 20 below zero. The three pilots, the tactical coordinator, the navigator, and the three sensor operators attended a mission briefing.

"I finally got to bed about seven this evening," said Bearden, 43, a 21-year P-3 veteran, "but at nine I decided to stop fighting it and just get up." He's

big, thick-boned—as patient as the grandfather he already is. The tires of our truck crunched over the hard dry snow of Thule Air Base, situated on the west coast of Greenland. In March each day was 40 minutes longer than the last, and even just after midnight it was not so much night as a dim, bluish twilight. The flightline was snow, packed hard as concrete. The P-3s looked ghost-like in their flat gray, low-visibility paint, steam billowing out from the portable heaters that kept the engine oil from



The heart of submarine detection lies in the P-3's belly, where sonobuoys await the chance to listen in on the enemy (above).

Each mission begins with a briefing that explains the particulars of the exercise (above left). Then it's off to the flightline to ready the aircraft (below).



turning to sludge, the seals from shattering like frozen gum.

0130. In air so cold it felt like fire on your cheeks, Bearden ran through his preflight check. He passed the flashlight beam over the edges of the P-3's wings, over rivets, and throughout the landing gear, searching "for cracks, dents, leaks of any sort, frayed cables, anything that's not normal," he said. It was so cold that after 15 minutes his flashlight went dim. He retreated inside the P-3, something he ended up doing three times before finishing.

0300. Dawn. The rest of the crew arrived from their mission briefing. (Two nuclear-powered attack submarines are lurking off the northeast coast of Greenland under the permanent ice zone, polar ice that never melts and is thick enough to land an airplane on. Beneath it is the ultimate place to hide. Somewhere in a 200- by 300-mile rectangle, three hours and 760 miles from Thule Air Base, skulk our quarry, the *Trenchant* and the *Whale*. There will be no further coordination or communication between the subs and the P-3.)

"They'll be running real quiet today," said Ken Crowe, the tactical coordinator, or "Tacco." It's his job to oversee the mission by deciding when and where to drop buoys, synthesizing the information collected by his three sensor operators, and directing the pilot until the sub is found.

0310. Lead pilot David Nelson, 30, big-chested and square-jawed, headed out in the cold with his flashlight to double-check the airplane. (You can't be too careful up here in the Arctic.)

Outside, ordnance man Maynor stuffed buoys into the 48 drop chutes in the P-3's belly. A twist, and the 24-pound buoys were locked in place. A small explosive charge will release them when the pilot or Tacco pushes a button.

In the galley moments later, Maynor stowed the "One Way Award," a wooden plaque pasted with a sticker of a one-way street sign. "We give it to the guy who does something that shows he's thinking only one way," said Maynor with a wink, "like only of himself."

"I got it this morning," said Bearden, shaking his head, "but they won't tell me why."

Crew Six has the camaraderie of a college fraternity. Crews typically stay

The Lockheed P-3C Orion

If the P-3 seems to have a familiar shape, it's because the airframe was derived from the Lockheed Electra II airliner, which flew during the 1950s. Powered by four Allison turboprop engines, the P-3 is perfect for all types of maritime patrol: it's powerful and fuel-efficient at low altitudes and it can fly 14 hours without refueling. But what makes the P-3 such an effective sub hunter are the anti-submarine warfare modifications the aircraft has undergone. Bristling with dozens of communication, navigation, and sensor electronics, the P-3 can comb vast amounts of ocean in a single 12-hour mission. And once a sub is found, a P-3 could, if necessary, release some of the mines, torpedoes, and depth bombs that it carries in its belly.



together for six to nine months of training followed by a six-month deployment. They share barracks, party together, and, of course, fly cooped up hour after hour, week upon week. When it comes time to find a submarine, their teamwork is essential.

0410. The portable heaters were removed so the P-3 could be fueled. Despite the early hour, the sky was already bright blue and cloudless.

0445. One by one the four engines roared to life, and 30 minutes later we lifted off. Airborne, the crew fell asleep as if drugged.

In the galley, Jim Nuyen sipped coffee before hitting the deck. "During a deployment at Siganelia, Sicily," he told me, "we discovered this buoy in the Mediterranean where the Soviet task force went to get serviced. One day my roommate came back from a flight and said, 'You're not going to believe this,

but this Soviet submarine crew was mooning us.' I said, 'No way.' But back then we flew down and took pictures of everything, and he showed me the film. I couldn't believe it. From bow to stern were butts shining brightly!"

It was an unusually light moment in an otherwise relentless game of cold war hide and seek. Beginning in World War II, the Navy's maritime patrol aircraft—the eyes and ears of the fleet—combed the oceans for enemy U-boats, reported ship movements, observed the weather, and performed search-and-rescue operations. Since the early 1960s, the Navy's patrol workhorse has been the P-3. After the 1962 Cuban missile crisis, the Soviet Union decided to build a blue-water navy—particularly a fleet of nuclear-powered ballistic missile submarines—and the P-3's importance was dramatically heightened.

To military strategists, no tool of war



elicits as much reverence and fear as submarines, which can remain undetected around the globe. One sub can sink an aircraft carrier and disappear so quickly no one would even know who did it. Intercontinental ballistic missiles, bombers—they can be watched, counted, and tracked with radar and satellites. But a nuclear-powered sub can travel fast and deep. It can wait 300 miles off the coast of New York and launch a dozen missiles, each with multiple warheads, that can hit their targets in minutes. It is the most survivable of all nuclear deterrents. And in the 1970s and '80s, Soviet subs were everywhere. The P-3, awkward, stubby, and slow, became the cornerstone in the Navy's anti-submarine warfare effort. (The twin-jet Lockheed S-3 Viking, a carrier-based anti-submarine patrol aircraft equipped like the P-3, is designed to protect a carrier and lacks the big turboprop's endurance over an observing point.)

Until the end of the cold war, 24 active squadrons of nine P-3s each were

deployed out of Bermuda, Iceland, the Azores, Spain, Sicily, Alaska, Guam, Diego Garcia, the Philippines, Oman, East Africa, and Okinawa. They did not simply fly over miles and miles of empty ocean hoping to stumble upon a sub. "Prosecuting" a submarine, as it is called, begins with "cueing." At its simplest, cueing might be nothing more than analyzing past deployment locations and patterns. Soviet subs were known to sit in the deep waters off Bermuda, for example, and they had to enter and exit the Mediterranean by passing through the narrow Strait of Gibraltar. At cueing's most complex—well, the Navy will not reveal the intelligence sources it uses to cue in on the enemy, but the sources include permanently deployed buoys arrayed throughout the world's oceans.

Sent to a clearly defined "station" based on cueing, P-3 crews would begin their hunt, coordinated by the Tacco. They could use the naked eye (in the Caribbean and Mediterranean a sub at a periscope depth of 80 feet can be

Once an Eskimo settlement, Thule was chosen as the site for a U.S. air base during World War II. Frightened away by the constant noise of airplanes, the walrus and polar bear populations dwindled, forcing the Eskimo to move.

seen), as well as inverse synthetic aperture radar, which displays a detailed black-and-white image of an object, instead of just a blip. (But ISAR works only if some part of the sub—even if it's just the periscope—is above the waterline.) The long boom that protrudes from the P-3's tail holds a powerful magnetic anomaly detector that can pick up a submerged sub's magnetic signature. Along with small, sophisticated listening devices called sonobuoys, P-3 crews proved remarkably adept not just at finding the general whereabouts of Soviet subs but at "localizing" or pinpointing them within the attack range of the P-3's torpedoes. In the 1980s, crews on six-month deployments easily racked up hundreds of hours on top of Soviet

subs, becoming among the only crews in the military to train against the very units they might one day have to fight.

In the late 1980s, staging out of Keflavik, "we flew a lot, and probably two-thirds of the time was on contact," remembers Crew Six's copilot David Saliga. "Those were the good days. As soon as you gained the guy, you flew 24 hours continuously on him [aircraft and crews would rotate]. That was exciting, especially taking all your sensor data and tracking this unknown enigma and prosecuting it for four or five days. And most of the time he probably never even knew we were there."

In 1984 the Soviet Union introduced a new generation of ballistic missile-carrying submarines. They were hardened so that they could surface through the polar ice to launch their missiles, and they were big enough to carry missiles capable of hitting the United States from the North Pole. Suddenly, the Soviets didn't have to deploy in the deep waters of the Atlantic—easy hunting ground for P-3s. They could be just as

threatening while hiding safely under the ice cap.

The P-3s followed almost immediately, and since 1985 the Navy has been holding yearly spring exercises to practice tracking subs concealed by polar ice, a task once thought impossible. For this two-week exercise, held last March and April, five U.S. airplanes and one sub (the *Whale*) trained with three other NATO countries that joined the hunt: Canada flying two Auroras (its version of the P-3), Holland flying one P-3, and Britain running its sub the *Trenchant*.

0815. We arrive on station over the ice. During the last 30 minutes, the slumbering crew has revived, helped along by cups of coffee. Sleeping bags and parkas are stowed, sensors turned on and readied. Suddenly the P-3 is flying 220 mph, and the action is so fast it's nearly impossible to keep up. One minute we're flying at 6,500 feet, the next we dive to 200, "yanking and banking," as Saliga calls it, and bumping and jolting low over a vast ice field criss-

crossed by jumbled ridges that look like mole trails on a golf course. The engines roar. The horizon shifts violently to the left, then to the right. We climb to 1,000 feet, bank, descend to 800, then 700, then down to 200 again. This goes on nonstop for three hours. Frantic voices crackle over the headsets from all the different stations.

"Hey Wingnut," Saliga says to Wilkenson, who is manning the inverse synthetic aperture radar, "can you pick out any holes?"

"About 10 o'clock," says Wilkenson, "what's that look like?"

We descend to 800 feet but see no breaks in the ice.

"Okay," says Tacco Crowe, "stay right here and if it's still solid, we'll do a geobuoy first. Let's go down to 700 feet."

At the heart of anti-submarine war-

Thule's dry, frigid air takes its toll on the aircraft, increasing the need for inspections and making routine servicing more difficult.



fare are so-called “wet” sonobuoys—sensitive microphones that can be programmed to float at specific depths and transmit their information over specific radio frequencies. After transmitting from four to 12 hours, the sonobuoys sink and are not recoverable. To listen to one, especially roaring along in a noisy aircraft, is to be suddenly and eerily connected to the depths: the gentle tinkle of water, the melancholy moans of a whale. Since the speed at which sound travels through water depends on its temperature, other buoys, called bathythermographs, or BTs, measure the water’s temperature at different depths. And still other sonobuoys operate as small sonars, sending forth a sound wave that will bounce off an object. By measuring the time it takes for the signal to be reflected from the object, sensor operators can determine the target’s bearing; triangulating from two different buoys reveals the object’s exact location, as well as its heading.

Ideally, the Tacco lays a straight line of equidistant buoys across what he hopes is the quarry’s path. A second line perpendicular to the first tightens the web.

At least that’s how it’s supposed to work.

Add high winds, rough seas, rain, fog, lots of noisy mammals, nearby ship traffic, the airplane’s speed, turbulence, equipment failures, and the flood of diverse information pouring in—most of which is extraneous—and the task becomes infinitely more complex.

Or just add ice.

Ice prevents the laying of sonobuoys and the dropping of weapons. And until the Navy, aided by civilian scientists at the Naval Air Warfare Center in Warminster, Pennsylvania, came up with a new sub-hunting strategy in 1985, that was the end of the story. The key to the new strategy is based on the nature of the Arctic ice itself. Since even the thickest ice is composed of constantly shifting floes, there are nearly

always narrow cracks, called leads, or small holes through which—with practice—a crew can drop buoys and torpedoes. And if there are no nearby holes or leads, specially designed “geobuoys” can be dropped and embedded in solid ice, through which they can pick up

If the air crews visiting Thule tire of the base’s quiet isolation (below), they can look forward to plenty of excitement once they’re in the air. Opposite: In missions that typically last nine to 12 hours, there are at least three hours of rugged flying, during which the pilots and flight engineer (top) put the P-3 through its paces over the ice. While the pilots are busy keeping the P-3 safely aloft, the navigator-communicator (bottom left) keeps them informed of the P-3’s position and maintains radio contact with the outside world. Once the hunt has ended, the preferred activity is sleep (bottom right).





the quiet rumblings of a prowling submarine. They remain, however, a clear second choice to their wet cousins.

0825. "We've got a good patch in sight," says lead pilot Nelson.

"Roger," says Crowe.

At 700 feet, we bank sharply to the left, fast approaching a large, solid-looking floe.

Saliga: "Stand by for buoy drop. What are the winds?"

Crowe: "Three four five at 16."

"Okay, buoy away...now...now...NOW!" yells Nelson, pressing the button, or

pickle, to release the buoy. "I want to circle around and see what it hit." We bank sharply again and head back to the buoy.

After four or five buoys, nothing. The geobuoys aren't sticking in the ice, and the thinnish gray patches of recently refrozen leads are too thick to allow wet buoys to penetrate. Crowe decides to try a different location.

Events happen quickly in a world moving at 220 mph. We drop buoys, listen, search, bank, climb, and descend—the stark white ice ripping past, the hori-

zon a dizzyingly unstable line, the P-3 shaking through the turbulent air.

Suddenly we come upon a long narrow crack in the ice, steam rising from calm, inky black water.

"I'm trying to plant a line east-west," says Crowe; "how does this hole work?"

Saliga: "East-west."

Crowe: "Perfect! I want it as close as possible along that line."

Saliga: "Roger, we're going to ride it in for you, Kenny."

Nelson: "You select 'em and I'll punch 'em in. Give me what you want."



Crowe: "One thousand, two thousand yards [apart]."

We bank right and start skimming 200 feet over the crack, which is maybe 15 feet wide.

Nelson: "Okay, buoy away, now...now...NOW!"

The buoy doesn't go in. We bank hard around, the lower wing appearing dangerously close to the ice.

Crowe: "Okay, another selected."

We zigzag down the steaming crack again. Nelson drops another buoy, and another, and another, and another.

Sensor two: "I'm getting a lot of biologics on six. There's a lot of whales down here."

And suddenly: "Tacco! This is sensor one, go to heading..." and at that moment I'm taken off the headsets for "security reasons." (Later, I'm told that the hunt included a discussion of the subs' acoustic signatures, information the Navy considers sensitive.)

The action ratchets up wildly. We bank, we climb, we drop buoys, we overfly those same buoys. The buoys' radio transmitters are relatively weak, and we can barely pick them up at 200 feet. So we have to continuously overfly the buoys, or climb to an altitude where the reception is clear. Each buoy, which has a number, appears as a bright green point on the radar screen in front of the pilots. A more or less straight line stretches across the screen. "We keep getting little leads but we can't get a bearing," Saliga explains, clearly on the edge of his seat. "She's out here somewhere. But we need more places to drop more buoys."

Suddenly, I'm put back on the headset. "Come on baby, find a lead, find something!" mumbles Saliga.

"Right there!" shouts Nelson, pointing to a small hole approaching fast at 11 o'clock. Hard bank to the left. "Now...now...NOW! That's nice!"

Five seconds later he pops another buoy in yet another new hole. "Let's hit it to the left," says Crowe. "Come around to the same area and we'll be good to go."

With the end of the cold war spelling a diminished threat from Russian subs, the P-3 and its crews fly into an uncertain future.

"Contact on six!" sensor one yells. "We're pinging! More buoys! I've got a weak bearing out of number six. Now I've got a bearing on four."

Crowe: "If he's going east we've got a perfect straight line of water."

Sensor one: "Bearing two five zero."

Crowe: "There you go! There's a ball and a bat!"

Saliga: "You want to open bomb bays for a simulated?"

Nelson frantically punches buttons under his radar screen, arming the Mark 46 torpedo. A one-inch range circle pops up. If the submarine remains within the circle, the weapon will find its target.

Nelson: "Mark on top now...now...NOW! Battle conditions accepted?"

Saliga: "Accepted."

Nelson: "Weapon away."

And just like that, the fight is over. Checkmate. Suddenly the *Trenchant* or *Whale* (we're not told which) seems fragile, vulnerable, a prisoner of its cold hiding place. "It's great when the whole crew is working together and we make contact," says Nelson, slapping a high five with Saliga before pulling the yoke back and heading for home.

As we climb to 25,000 feet, the ride smooths out—finally—and one by one much of the crew, save the pilots and flight engineer, falls asleep. "That was exciting," says Crowe. "When the sensors start calling contact, your heart starts racing."

Back at the coffee pot in the galley, talk turns to encounters with the enemy. "In my old squadron, when we crossed over the Arctic Circle you'd get a blue nose with an indelible marker," says Saliga. "The first time I did it we also hit our first Soviet sub so we took liberty with both the blue and red markers. We had half our faces blue and half red and we were dancing up the aisle naked."

"Yeah," says Bearden, "back in '77, '78, we were on everything: Echoes, Charleys, Deltas, Yankees—we saw it all. But these young guys, they don't see anything."

The stories are nostalgic because now that the cold war has ended, no Russian sub has ventured this far into the Arctic Ocean or into the central Atlantic in two years. Of Crew Six's five officers, only Dave Saliga has spent time over a real Russian sub. Of its seven en-

listed crew members, only Bearden, Nuyen, Maynor, and Arrozola have. "In three years," says Nelson, "I've never done any real anti-submarine warfare. It's kind of too bad."

2000. Outside it's 20 below and the sun is shining brightly. But here in Cheers, the temporary bar set up by the Canadians and serving 24 hours a day, it's dim, smoky, and hot. A missile hangs over the bar, scrawled with the autographs of dozens of P-3 fliers. Over the speakers, the rock and roll singer Meatloaf screams, drowning out the NCAA final fours on the television. Crew Six's mission finally ended at 1430, after they turned in tapes of their hunt for analysis, and now they're surrounding Wingnut. He's holding a coffee pot filled with four Budweisers, two shots of something called "Thule Shooters," and an unknown number of Tabasco squirts. He drinks deeply, to cheers and hoots. At the bottom of this concoction lie his coveted silver wings. As of today, Wingnut is an enlisted air warfare specialist.

Exactly how he'll use his wings remains unclear. The P-7, the Navy's proposed new land-based anti-submarine warfare platform, has been canceled. Which means that P-3s will have to stay in the Navy's inventory indefinitely. "These airplanes will be around well into the next century," says Ralph Dean, the commanding officer at last year's exercises. The number of active-duty P-3 squadrons has been cut from 24 to 13. And there is talk of more cuts.

When Crew Six's patrol squadron was deployed to Puerto Rico last fall, it hunted not subs but narcotics traffickers. The sonobuoys never left their storage racks. Instead, the maritime patrol aviators, for the most part, used their eyes and radars. "After a deployment in Siganeella or Keflavik in the old days," says Dean, "a crew would come back really sharp at anti-submarine warfare, which is much more difficult than eyeball work. But today there just isn't the sub threat and there just isn't money for anything but the crisis of the moment, which is drugs. It's a shame, because the skills are perishable."

"The world," says Kenny Crowe, a highly trained quarterback in a game that may no longer be played, "changed too much before my time." —

"Tovarich!"

To arrange for the historic handshake between American and Soviet space travelers, mission planners had to rely on their diplomatic skills as much as their technological know-how.

by Brian Duff

They told us all kinds of horror stories," remembers Caldwell Johnson, "until I was afraid to get on the airplane." It was late in the afternoon on October 24, 1970, when he and the rest of a NASA delegation landed in Moscow, and as Johnson looked through the falling sleet he saw guards with fur hats and machine guns. "I wondered what we had gotten ourselves into," he says.

Johnson grew up near the Chesapeake Bay, where his first name is pronounced "Cadwell," and that's the way his friends at NASA always pronounce it. Now in his 70s, Johnson is retired from the space agency, but he still works near Houston's Johnson Space Center. His eyes twinkle as he remembers that trip to the Soviet Union. "The state department was furious and so was Army intelligence and the CIA," he says. "If it had not been that Nixon was flat out for it and said that NASA was in charge, we wouldn't have been there."

At the time, Johnson was chief of the spacecraft design division at the



On July 15, 1975, a Saturn I-B (left) lifted off to begin Apollo's journey to catch up with a Soviet Soyuz spacecraft already in orbit. To make the rendezvous—a unique collaboration between the two cold war superpowers—the Soviets had launched seven and a half hours before the Americans.





SOYFOTO (2)

Manned Spacecraft Center (now Johnson Space Center), and he had been asked to be part of a delegation sent over to discuss the development of devices that would enable Soviet and U.S. craft to dock with each other in space. It would be the first in a series of meetings that would culminate with one taking place not in Moscow or Houston but in Earth orbit. There, an American Apollo and Soviet Soyuz spacecraft would rendezvous and test the feasibility of an emergency rescue mission.

People had suggested joint space missions before, but true collaboration had been limited to a handful of meteorological and telecommunications agreements. The 1957 launch of Sputnik, the world's first artificial satellite, had effectively undermined any spirit of cooperation between the two superpowers. "I always had a personal distaste for the space race..." says Arnold Frutkin, who directed the international programs office at NASA. "Yet I felt very let down that night when the announcement [of the Sputnik launch] was made. It seemed to reflect terribly on us."

The response to Sputnik did lead to a Congressional act creating NASA and with it a legislative mandate to seek international cooperation. Frutkin recalls that T. Keith Glennan, NASA's first administrator, "used to carry a copy of the act around in his pocket. He wanted to give life to that clause."

In preparation for the Apollo-Soyuz Test Project, the astronauts made three trips to the Soviet Union. The visits included sightseeing at Registan square in Samarkand (left) and attending a ballet at the Bolshoi Theater (opposite).

Yet it took the impact of the Apollo 11 moon landing and the thawing effects of détente to make any headway. (A 1969 fictional movie called *Marooned*, in which cosmonauts help save Americans stranded in space, also contributed to development of the Apollo-Soyuz project.) In September 1970, Mstislav Keldysh, the president of the Soviet Academy of Sciences, invited NASA to hold exploratory discussions. A month later the five-man NASA delegation that Caldwell Johnson had joined arrived in Moscow.

The NASA delegation had little idea of what to expect. "We talked among ourselves and decided it had to be some kind of cooperative mission," says Johnson. At the first meeting with Soviet engineers in Moscow, the NASA group put up a viewgraph of its concept for a compatible docking mechanism. The Soviet engineers nodded vigorously. "It didn't take 10 minutes before we knew we were both thinking about a joint mission," says Johnson. Every NASA technician found

The cosmonaut crew trained for a possible splashdown (opposite), although the mission plan called for a descent to dry land. In the United States, both crews visited with President Gerald Ford at the White House prior to the mission.

says Johnson. "We talked to Bob Gilruth [director of the Manned Spacecraft Center] and he said, 'Let's take our drawings with us.'"

Six months later the Soviet engineers came to Houston and presented advanced designs for a compatible docking mechanism based on the concept the Americans had introduced at the first meeting. The development of this docking system was an important step for a joint mission in space because it established a pattern of face-to-face collaboration between the teams. At the Moscow Summit in May 1972, President Nixon and Premier Kosygin officially announced the Apollo-Soyuz Test Project (ASTP).

While the politics of the Apollo-Soyuz mission appeared to be resolved, another matter of compatibility arose, this one concerning the atmosphere aboard the two spacecraft. Soviet spacecraft were filled with an oxygen-nitrogen atmosphere pressurized to 14.7 pounds per square inch. The atmosphere in American spacecraft was pure oxygen, which allowed a lower pressure of only five pounds per square inch to be used.

"It's hard to tell someone who is using the same air as we are breathing in this room that they are wrong," says Caldwell Johnson. "They had the correct system. They were concerned about us and they had a right to be concerned. Oxygen is flammable and they had things in their spacecraft which could burn."

The Apollo spacecraft used the low-pressure atmosphere because it created less stress on a spacecraft's structure, according to Johnson. "We had convinced ourselves it was too



he had a matching counterpart. "We fit just like this," says Johnson, locking his fingers together. "There were no politicians. Just engineers."

Up to that point, the NASA docking system required a mechanical joining of a probe and a drogue, which meant that only spacecraft with the opposite equipment could dock. In addition, the probe was designed to occupy the passageway between the two spacecraft, and "if it jammed the whole operation was at risk," according to Johnson. By the time of the Moscow meeting NASA designers were looking for a better system. "We knew we were going to need one soon," says Johnson, "because ours was a pain and so was theirs." The Houston engineers had been studying docking devices that featured latches and guides on the outside of the docking mechanism and permitted better alignment. "We had even built mockups and tested them,"





"Open Door Day" at the Yuri Gagarin cosmonauts' training center found astronauts Vance Brand (left) and Deke Slayton the focus of attention. Opposite, Brand and Valery Kubasov train at the center, which the astronauts found to be rather backward by NASA standards.

much trouble to fix. But it wasn't too much trouble. We fixed it for the shuttle." In retrospect, Johnson can't believe NASA stayed with the flammable and cumbersome pure oxygen atmosphere as long as it did. "It was terribly dangerous," he says. "We knew that even before the [Apollo 1] fire. It was a massive mistake. I still can't imagine so many of us making that mistake."

The solution to the atmosphere problem was a docking module, which was carried into space on the nose of the Apollo spacecraft and acted as a regulator between the two environments. Before transferring between the two spacecraft, the Apollo crew would enter the docking module and add nitrogen until its atmospheric pressure was 10 pounds per square inch. The Soviets agreed to reduce their atmospheric pressure while docked. The module, which would be left behind in space, and the two collars that joined both spacecraft were the only equipment designed specifically for the mission.

In addition to providing an airlock between the two vehicles, the docking module was also intended to be a sanctuary, both physically and psychologically, for the astronauts. It was "a little bit of American soil," says NASA engineer Craig Covington. "We wanted a U.S.-designed piece of equipment we could bring up to their pressure but—if we had a problem—our guys could dive back into the module and slam the hatch behind them."



Johnson gives the Russian engineers full credit for their contribution. He especially admired Vladimir Syromiatnikov, the Soviet docking specialist, for being so willing to accept outside suggestions. Not everyone, however, was as enthusiastic about sharing ideas: critics in the United States charged that ASTP was a technology giveaway. Christopher C. Kraft, then director of the Manned Space Center, dismisses that notion. "The only thing we showed them was our way of managing programs," he says, "and in their culture they couldn't apply it." Glynn Lunney, chief of the flight director's office, agrees: "Our big advantage back then was computers. But

people tend to confuse proximity with knowledge. Just because I can stand next to a computer doesn't mean I know how to build one."

Now president of the Rockwell Space Operations Company in Houston, Lunney is "the unsung hero of ASTP," says Kraft, who picked him to be the mission's project director. Only 35 at the time, Lunney had already served as flight director, chief of flight operations, and, most recently, manager of the Apollo spacecraft program office. "He was an outgoing young man, he knew all the facets of flight operations, and"—Kraft grins—"he was available."

It was Lunney who set the respectful tone necessary for a successful relationship with the Soviets. "I think the Russians absolutely adored the man," says Kraft about Lunney. He always addressed his Soviet counterpart, Konstantin Bushuyev, as "professor" and the other Americans began to do the same. Lunney's diplomacy proved invaluable when American engineers needed access to information.

"We had to push them on it," remembers Lunney. "We had to say that we must have the information or we were just not going to do this thing." One of those "need to know" subjects was a detailed explanation of the causes of the Soyuz 11 accident, in which three cosmonauts died in June 1971 when their capsule decompressed during reentry into Earth's atmosphere. "They kind of slow-rolled us at first," says Lunney, "but

we insisted that we had to understand everything which might reflect a risk or create a technical situation which could affect our part of the flight."

The Americans came to realize that their questions, in addition to taxing the Russian engineers, were straining the whole Soviet command structure. "They had to go home and make our arguments all over again up their own chain of command," says Lunney. "It often took considerable time—sometimes months—but generally they came back with the information."

Lunney was aided in his dealings with the Soviets by a Russian-born expatriate named Alexis B. Tatistcheff, who served as his U.S. interpreter. "Alexis was about 70 at that time," Lunney remembers. "He became my counselor and confidante. I began to see through his eyes and to understand the constraints the Soviet regime imposed on the Russian engineers." Tatistcheff helped Lunney understand how Bushuyev, Lunney's Soviet counterpart, was faced with the problem of safeguarding his career as a prominent scientist and engineer and at the same time making ASTP a success. Bushuyev's only hope, explained Tatistcheff, was to keep bombarding his superiors with NASA requests without appearing to support them. Tatistcheff also told Lunney not to worry about embarrassing the Russian project leader. Anyone who had risen as far in the Soviet system as Bushuyev had was, in the translator's words, "unembarrassable."



The unprecedented joint mission between the two cold war rivals occasioned a number of tributes from around the world.





SOVFOFO 121

Valery Kubasov, a highly respected flight engineer, trained inside a Soyuz mockup (above). Training long over, U.S. personnel monitored the actual docking from the flight control center near Moscow (below).



Indeed, Bushuyev took Lunney aside during a visit to the Houston Astrodome and pleaded with him to keep up the pressure to extract technical information and meet schedules. Bushuyev explained that Moscow was increasingly open to these requests but that he could not express any official reaction on behalf of the Soviet Union.

To downplay the extent to which the military was involved in its space program, the Soviets tried to give the impression that the Apollo-Soyuz project was in the hands of a civilian government organization not unlike NASA. So although Bushuyev had spent most of his working life at the former Korolev Design Bureau, an elaborate charade now required that he be introduced as an employee of the Soviet Academy of Sciences' Space Research Institute. The charade continued even after his death. In *The Making of a Soviet Scientist*, Roald Sagdeev writes that after Bushuyev died in 1978

the military moved his funeral ceremony to the institute as a cover in case "nosy Americans" planned to attend.

From 1973 to 1988 Sagdeev served as director of the institute, which "had been given the role of providing the window dressing for the American visitors." In his book he recounts how the staff at the institute, which was the site of the ASTP meetings and negotiations, was instructed to pretend to represent the Soviet counterpart of NASA. "We had to puff up our chests and represent the heart of the Soviet space program while it was very clear, even for amateurs, that we were nothing but a bunch of scientists—the poor relatives of the rich space czars."

Soviet negotiators were introduced to their American counterparts as institute staff, according to Sagdeev, even though "some of them had only an hour before changed from their military uniforms to civilian clothes." Sagdeev also describes how, prior to the arrival of American visitors, a briefing report was sometimes distributed to the Soviet workers that offered "answers to hundreds of questions that might be asked by those 'nosy Americans.'"

The Americans tried to be sensitive to Soviet security restrictions. "We adopted an attitude that we were not there to spy or pry," says Lunney. "But there were things we had to know for the success or the safety of the project." As the mission developed the teams got to know each other better, and according to Caldwell Johnson, "we were treated with nothing but courtesy and kindness."

They also got better acquainted with each other's working style. The Americans were impressed by the work eth-

ic of their counterparts but were concerned that the Soviets worked too hard. Pete Frank, chairman of NASA's joint operations working group, recalls: "We always had plenty of backup, but they had to work very hard. We were afraid they were going to get sick, they worked so hard."

In January 1973 NASA announced the Apollo crew members: Vance Brand, Deke Slayton, and, as crew commander, Tom Stafford. In addition to his experience aboard Gemini 6 and 9 and Apollo 10, Stafford had made important contacts in the Soviet Union when he attended the funeral of the Soyuz 11 cosmonauts.

The selection of Deke Slayton was a popular one. An original Mercury 7 astronaut, Slayton had been grounded by an irregular heartbeat before he could fly in space, then served as head of NASA's astronaut office. Earthbound for all those years, he brought an endearing enthusiasm to the mission. When teased about his advanced age (he was 51 when he finally flew in space), Slayton would gleefully retort: "Better an overage rookie than an overage has-been."

The Soyuz crew would consist of Alexei Leonov, the first man to walk in space, and Valery Kubasov, a flight engineer who had flown on Soyuz 6.

It had been decided that each crew would speak the other's language. This was easier for some than others, and Leonov would refer to Oklahoma-born and -bred Tom Stafford's version of Russian as "Oklahomski." In the book *Moonshot*, Deke Slayton concedes, "The hardest part of the entire training was learning to speak Russian."

The astronauts made three trips to Russia: in October 1973, July 1974, and April 1975. Tom Stafford, now a retired Air Force lieutenant general and business consultant, was not encouraged when he saw the Soviet ground equipment. "They didn't have flight simulators like we did—theirs were just procedures trainers." The contrast between the two countries' facilities proved the biggest gap in preparing for the



The inverted hug shared by Alexei Leonov and Deke Slayton aboard the Soyuz attested to a real friendship that developed during the project. At mission's end, Soviet controllers in Houston applauded the Soyuz's landing (below).



mission. "They just didn't have the kind of support the Americans were used to to make the job easier—things like copying machines—but as it evolved we realized that, while they lacked the niceties, their fundamental science and engineering was as good as anybody's," says Pete Frank.

No Soviet technology or hardware ever gave NASA a concern about safety. "It's been said they were cavalier with people's safety," says Lunney. "I found them to be very rigorous regarding the safety of the cosmonauts. Their equipment is reliable and some of it has been working for years. In the end you have to judge by outcome and not by appearance or process." Chris Kraft concurs: "They didn't have some of the tools we had, like computers and advanced metallurgy, but they had a solid understanding of space and space systems. They were very good at using what they had and not changing things unless they had to. Maybe that was because changes were too hard to get done for them."

Nonetheless, according to Kraft, the Americans bore the responsibility for the success of the flight. "They took zero risk," he says. "We did everything that was hard, everything that had to be done on time, everything that required any kind of complexity. We had to rendezvous; we had to get off on time; we did the docking maneuver. They were passive." (It had been agreed that the Soyuz would launch first and wait for Apollo, which meant that the American spacecraft had to effect the rendezvous. This was partly because the Soyuz of that period had limited maneuvering ability. Kraft says he believes the mission was structured the way it was because Soviet leaders wanted to minimize any potential embarrassment for the Soviet Union.)

The culture shock went both ways. NASA worked hard to make the Soviet visitors feel comfortable, but in hindsight Pete Frank has second thoughts. "Maybe we weren't too sensitive," he says. "It must have been overwhelming for them to come here and find us living in two-story houses in the woods. Then, to rub it in, we always had to take them on a tour of the house and show them everything."

Some of the Russians thought the homes of the NASA engineers were part of an elaborate propaganda sham, a Space Age Potemkin village. At one party at the home of Nick Timacheff, who ran NASA's Russian language program in Houston, a senior Soviet delegate insisted that Timacheff's house and swimming pool must have been a government loan to impress the Russian guests. "It wasn't until I asked my dog, in Russian, to go get my slippers—and the dog got them—that he believed me," says Timacheff.

The Russians had other, more serious doubts about the Americans. "They were afraid of what our astronauts were going to do," says Lunney. Many of the Russian flight maneuvers—the docking sequence, for example—were automated, while the Americans preferred to delegate a good deal of autonomy to their astronauts. "The problem with an automated program is that if it doesn't work you have to go home," says Lunney. "When they worried about the astronauts, we just took them into the simulators and let them watch the crew go through the routine."

This kind of access wasn't always reciprocated. On the astronauts' third and last visit to Russia, Tom Stafford threatened to pull out of the mission if his crew wasn't allowed in-

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Mission accomplished, Leonov and Kubasov returned to a hero's welcome in Moscow. American Tom Stafford found that he too had fans among Muscovites (top).

side the actual Soyuz spacecraft. "They wanted to show me a mockup," he said, "but I told them none of my crew would fly, and neither would Al Bean's backup crew, unless we got the real thing."

Stafford also insisted that his crew inspect the Soviet launch site at Baikonur. "Only Charles de Gaulle had seen it before us," he says. The visit occurred at night, no doubt to protect secrets at the military facility.

Stafford additionally demanded that the Soviets allow live television coverage of the docking. "Ours was the first live TV of a Soviet space mission," he says, "and it didn't happen again for years afterward."

So on July 17, 1975, both Soviets and Americans were able to watch the Apollo and Soyuz spacecraft dock some 140 miles over Portugal. Mission commander Tom Stafford extended a hand to Alexei Leonov and said, "*Tovarich!*" The Soviet word translates as "friend," and indeed, the con-

tentiousness of the SALT treaty talks back on Earth seemed much diminished by the spirit of conviviality in which the two spacemen greeted each other. The spacecraft remained docked for two days, during which the crews exchanged gifts, shared meals, and performed a variety of scientific experiments.

After the Apollo-Soyuz Test Project, U.S.-Soviet cooperation in manned spaceflight sputtered to a halt. It would be the last Apollo mission, as well as the last launch of a Saturn I-B. NASA's attention had shifted to the space shuttle.

"At the time the Russians were more than ready to fly again....," says Lunney. "George Low [NASA's acting administrator] felt additional flights couldn't be justified to the Congress or to the taxpayers unless there was something additional to be gained. However, that didn't seem to trouble the Russians at all." In lieu of an ASTP sequel, the Soviets began to invite other nations to send representatives into space.

The historical significance of Apollo-Soyuz remains a subject of debate. "Technically, there was nothing to it," says Kraft. "We had done all this many times before. It was only the interface between the two cultures that made it difficult."

Roald Sagdeev refers to the Apollo-Soyuz mission as "the

most expensive handshake in the world." He dismisses the mission as a détente showcase and says it had nothing to do with science. "Be patient," he quotes Bushuyev in *The Making of a Soviet Scientist*. "The very next joint project will definitely be one of substance."

But the mission's ramifications continue to have a positive influence for both countries. "Many of the Russian engineers who worked on ASTP are involved in the current effort to collaborate on a space station," says Pete Frank. Caldwell Johnson keeps in touch with Vladimir Syromiatnikov, who developed the compatible docking system for Apollo-Soyuz. "I understand it's very similar to the one NPO Energia is proposing for the space station," says Johnson.

"I believe the legacy of ASTP is alive and well in our current relations with the Russians on Space Station," says Glynn Lunney. "Most of the key players on the Russian side of Space Station dealt with us on ASTP. As it's been relayed to me, they carry a great fondness for that experience and a respect for the American space program and the people in it. ASTP doesn't provide a model for how to do a joint space station, but it might give us a model for the spirit with which to do it."

Tom Stafford assesses his ASTP mission with clear-eyed affection. He remains friends with Alexei Leonov, and last year, when Deke Slayton died of cancer, Stafford made sure Leonov could attend the funeral. Yet the former astronaut is also mindful of the realities of space policy. "We set the groundwork with Apollo-Soyuz," says Stafford. "It started this whole process—but, like Apollo-Soyuz, what's going on today isn't about space—it's about foreign policy." —

After landing near the city of Arkalyk in Kazakhstan, Leonov signed the Soyuz 19's descent module. The Soviets expressed an interest in future joint missions, but the United States was finished with Apollo and focusing on the space shuttle.



Flying for the Motherland



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Soviet women like Raisa Surnachevskaya flew combat missions in World War II.

A Dance With Death: Soviet Airwomen in World War II by Anne Noggle. Texas A&M University Press, 1994. 318 pp., b&w photos, \$29.95 (hardcover).

When Charles Lindbergh visited the Soviet Union in 1938, he was surprised to find women flying in the Soviet air force. In fact, those women were the predecessors of the women combat aviators who flew in much greater numbers during World War II (see "Wings, Women, and War," Dec. 1993/Jan. 1994). Still little known, these pilots tell their stories eloquently in this new book by Anne Noggle.

Noggle, herself a former member of the U.S. Women Airforce Service Pilots during World War II, serves not so much as author as facilitator, allowing the 69 women (and one man) she interviewed to tell their stories in their own words. The real authors are the members of the 46th Guards Bomber Regiment, the 125th Guards Bomber Regiment, the 586th Fighter Regiment (Air Defense), and

several women fliers who were attached to male regiments.

The stories are never repetitive because the experiences and emotions are intensely personal. The accounts range from an armaments mechanic telling of her experiences loading bombs barehanded in sub-zero temperatures to a pilot discussing some of her 1,008 night bombing missions in an aircraft that before the war had been used as a cropduster and that had no radio and only minimal instrumentation.

Whether these women aviators were avowed Communists or, as they are now able to admit, not totally committed to their rulers' doctrines, one theme clearly emerges in their stories: all wanted to fly for the liberation of their country, their motherland. What also stands out in their accounts is a sense of camaraderie and devotion to one another, which still lingers. "We leave our business and illness aside, and come [to their annual reunions on the steps of the Bolshoi Theater] to see each other," explains

Valentin Markov. "Most of us are old and sick, but it is our sacred duty."

In addition to her contribution in bringing the stories of these gallant women to us, Noggle calls on her skills as a photographer and researcher. Each account usually includes a World War II-vintage photograph of the person telling her story, and at the end of the book, Noggle includes photographs she took of the women when she met them in the early 1990s. Many are wearing rows of medals. Their faces and postures display a touching pride, as well as courage. Now these women, whose stories were for so long unknown, can rightfully take their places in history.

A well-written and informative introduction by Christine A. White, professor of Russian history at Penn State and herself a pilot, provides an excellent history of Soviet women in combat and offers a framework for the remarkable stories that follow.

—Claudia M. Oakes, formerly a curator at the National Air and Space Museum, is assistant director for public programs at the Utah Museum of Natural History in Salt Lake City.

Skunk Works: A Personal Memoir of My Years at Lockheed by Ben R. Rich and Leo Janos. Little, Brown, 1994. 370 pp., b&w photos, \$24.95 (hardcover).

This is an unusual book for several reasons. First, since its subject is secret ("black") programs, much of the material that could have gone into the book has been censored. Second, it's an

autobiography with two protagonists: Ben Rich himself and Kelly Johnson, the founder of Lockheed's legendary Skunk Works facility, which has designed some of the most impressive aircraft ever built.



Rich's portrait of Johnson says a lot about both men. Unsparring in the credit he gives to Johnson and others, Rich describes how Johnson's second-guessing of his subordinates was almost invariably correct. Johnson tolerated fools for seconds and lack of integrity not at all. Rich also characterizes his boss of 20 years as "W.C. Fields without the humor."

Rich stepped into Johnson's shoes in 1975 and bet the reputation of the Skunk Works on the seemingly crazy ideas of a 36-year-old radome specialist named Denys Overholser, who thought that a radar-invisible airplane could be built without any curved surfaces. Rich puts the reader into an epic fight between radicals and conservatives, in the course of which Johnson literally kicked Rich in the rear end.

While Rich is generous in sharing the credit, his criticism can be direct. He believes that the B-2 should have been built by Lockheed, rather than Northrop. And his views on the U.S. Navy will be received with relish or rage, depending on the color of the reader's uniform.

This is a mass-market book, not a history. Journalists will object to the profusion of dialogue from the 1960s. Perhaps Rich kept a detailed daily journal, but if he didn't, it's doubtful he remembered quite that much. Then there is the odd historical head-scratcher: "McNamara was intent on buying a costly new bomber, the B-70," but in fact, he fought successfully against Congressional attempts to keep the program alive.

Kiss-and-tell books are for Hollywood, not the Pentagon's underground. Although the black budget surged to record levels after 1980, readers will search in vain for almost any reference to Skunk Works programs launched after the F-117 in 1978. Absurdly, CIA and U.S. Air Force censors prohibit Rich from identifying Groom Lake, the secret Nevada test base where much of his story takes place. While censors have made this book less than it should have been, it's still compulsory reading for Skunk Works fans. Perhaps a more accurate title would be *Ben Rich, Live But Not Entirely Uncensored*.

—Bill Sweetman writes for numerous aerospace and military trade journals.

Galileo: A Life by James Reston Jr. HarperCollins, 1994. 319 pp., \$25.00 (hardcover).

On October 31, 1992, Pope John Paul II formally recognized that the Church had erred: Galileo had been right after all. This final triumph for the Italian astronomer came 350 years after his death. That the story of his life still

intrigues and inspires is in part due to the colorful setting of post-Renaissance Italy, but even more so because of the classic twin themes his life embraced: a search for truth and a struggle with authority.

All of this and much more, including the sometimes unflattering details of Galileo's personal life, come alive in James Reston's popular biography. The book, which draws on material from the Vatican and elsewhere, reads like a novel while informing us



of myriad details that might be less memorable in a more conventional treatment. We follow Galileo from his early life in Pisa, to teaching in Padua and increasing fame in Venice, Medici Florence, and the Rome of Urban VIII, and finally to blindness and house arrest for heresy in Siena and Arcetri. All the while we see the broader events that shaped and constrained his actions, including the burning of Giordano Bruno for heresy in 1600. Although in the brief span of some 300 pages the detail can not be comprehensive, Reston provides notes and a bibliography for readers who wish to pursue further detail.

In the end, the story of Galileo is intriguing because the lessons of the astronomer continue to be learned, and Reston's biography inspires us to contemplate them. Ideally, I recommend reading the book while traveling in Italy, as I did this summer. In a land rich in history, it makes the landscape come alive, as seen through the eyes of one of its most remarkable citizens.

—Steven J. Dick is an astronomer and historian of science at the U.S. Naval Observatory in Washington, D.C.

TELEVISION

To celebrate the 100th birthday of the Lowell Observatory in Flagstaff, Arizona, the Discovery Channel will present "Stargazers" on December 5 at 9 p.m. (Eastern Time).

They Had a Dream: The Story of African-American Astronauts by J. Alfred Phelps. Presidio Press, 1994. 291 pp., b&w photos, \$24.95 (hardcover).

For two decades, America's astronaut corps was made up exclusively of white males. That changed in 1978, when NASA selected a crop of space shuttle astronauts that included women and minorities. In

They Had a Dream, J. Alfred Phelps vividly tells the story of the first African Americans to cross the color line at the edge of space. These six—five men and one woman—each encountered racism while growing up, and they are candid about their experiences. When future shuttle commander Fred Gregory arrived at his Washington, D.C. junior high school in 1954, the only person in the classroom was his teacher; his classmates were outside, part of a white student boycott. In the face of racism, Gregory, like his five astronaut colleagues, displayed a dogged persistence, which eventually got him into space.

Phelps' account is based largely on interviews with each of the astronauts that he profiles. Particularly intriguing was Ron McNair, who died aboard the *Challenger*. A talented physicist, he was also a karate teacher and an accomplished musician who brought along his saxophone on his first spaceflight.

For me, the most compelling part of Phelps' story is the beginning. Three decades ago, the Kennedy administration picked Air Force pilot Ed Dwight to become the first black astronaut. Phone calls from the White House got Dwight a place in the Air Force's "space school," which was run by Chuck Yeager, who



resented having to take a pilot he felt was underqualified. Dwight, who graduated from the school in 1963 but was not selected as an astronaut, believes he was a victim of racism, a charge Yeager

denies. Phelps thoroughly reviews the available evidence, including his interviews with Yeager and others. He concludes that racism "undoubtedly played a part" in what became known as the "Dwight affair," but that Dwight's status as a Kennedy shoo-in also made it inevitable that his presence would be resented in the fiercely competitive school. Dwight's vocal protests following his rejection by NASA only hurt his standing, according to Phelps, who suggests that Dwight might have made it into the astronaut program had he worked a little harder at the space school.

In any case, after Dwight's rejection, black Americans would wait another two decades to fly in space. (In June 1967, Robert Lawrence was named as an astronaut for the Air Force's Manned Orbiting Laboratory program, only to die in the crash of his F-104 jet six months later. The MOL program was canceled in 1969; had Lawrence lived, he would have had to wait until the shuttle era to fly.)

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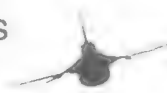
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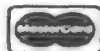
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REVIEWS & PREVIEWS

even though black Americans were ready to go where no one had gone before, they had to wait years for the opportunity.

—Andrew Chaikin is the author of *A Man on the Moon: The Voyages of the Apollo Astronauts* (Viking, 1994).

The Making of a Soviet Scientist: My Adventures in Nuclear Fusion and Space From Stalin to Star Wars by Roald Z. Sagdeev (ed. by Susan Eisenhower). Wiley, 1994. 339 pp., \$24.95 (hardcover).

When historians of the future look back at our century, surely one of the things that will catch their attention is that bizarre experiment in social planning we call the Soviet Union. Even today, only a few years after its demise, it seems somehow unreal. Great writers—Solzhenitsyn, Aksyonov, and others—are giving us one kind of record of the vanished revolution. Memoirs like this one, written by someone who simply lived inside the system, will prove just as valuable.

Roald Sagdeev, who is now a professor of physics at the University of Maryland, was a member of one of the Soviet Union's ethnic minorities, the Tartars. Identified early as gifted in science, he attended the elite Moscow University and pursued a career that put him in touch with the great Soviet scientists of the postwar era. His memoir chronicles his rise to director of the Space Research Institute and a position of power in the Soviet scientific hierarchy. For readers with a taste for science there are enlightening discussions of early fusion research and the building of the Soviet research complex at Novosibirsk. There are also fascinating stories about legends of Soviet science.

But the parts of the book that interested me most do not concern science or even the behavior of scientists. What struck me most were the outlandish experiences—outlandish at least to an American—that Sagdeev tosses off so offhandedly that it is clear they were part of daily Soviet life. He describes how



students, upon completing their schooling, would go into a room and be told where they had been assigned to work. And how the telephone that connected Sagdeev's office to the Party apparatus was

suddenly disconnected when he refused to sign a letter condemning physicist Andrei Sakharov. These are the sorts of insights that make *The Making of a Soviet Scientist* well worth reading.

—James Trefil is a Clarence J. Robinson Professor of Physics at George Mason University in Fairfax, Virginia.

Zero: Japan's Legendary World War II Fighter by Robert C. Mikesh.
Motorbooks International, 1994. 128 pp., b&w and color photos, \$19.95 (paperback).

Much has been written about the Mitsubishi A6M Zero, but Robert Mikesh, formerly a curator at the National Air and Space Museum, has told the story again, in the finest book ever published on Japan's navy fighter.

Despite its fierce reputation, the Zero had flaws. Its radio was balky. Its much-feared cannon proved less effective than the large-caliber machine guns that Americans favored. It sacrificed strength for agility and range, and for years it did without pilot armor or self-sealing fuel tanks because Japan lacked an engine powerful enough to carry their weight.

Even more serious, Japan failed to build a replacement fighter in sufficient numbers. Indeed, it didn't even build enough Zeros: 10,815 in six years. (Given the recent argument over the cost of an American invasion of Japan, it is sobering to note that the admirals hoped to take delivery on 6,300 copies of a much-improved A6M8 in 1946.)

For all that, the Zero had a sleek and fearsome beauty. As Mikesh writes: "Whatever that [ingredient] was—be it design, balance, style, or engineering genius—because of it, this airplane will stand apart from all others."

In retrospect, it's clear that the Zero was never as invincible as Americans believed at the outbreak of war, nor as obsolete as it seemed toward the end. The difference lay in the pilots. In December 1941, Japanese airmen literally flew circles around their opponents, using skill and daring (and the Zero's mystique) to compensate for a vulnerable airframe. By 1945, the fighter planes on both sides were much improved—as were the skills of U.S. airmen. Japan, however, lost its

best pilots in the first year of war, and never saw their like again.

—Daniel Ford wrote about the Martin B-26 Marauder in the June/July 1994 issue.



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CREDITS

The Airship Hangar at the Top of the World. P.J. Capelotti is a doctoral candidate in anthropology at Rutgers University and the author of *Explorer's Air Yacht: The Sikorsky S-38 Flying Boat* (Pictorial Histories, 1994).

Further reading: *The Wellman Airship Expeditions at Virgohamn, Danskøya, Svalbard*, P.J. Capelotti, Norwegian Polar Institute, 1994.

Beast Intentions. O.H. Billmann is a frequent contributor to *Air & Space/Smithsonian*.

Dreams for Sale. William Triplett, a Washington, D.C.-based freelance writer, is a contributing editor at *Air & Space/Smithsonian*.

Sunset on Pulkovo. Robert A. McCutcheon is a spacecraft attitude analyst working on the Hubble Space Telescope project. Fluent in Russian, he has made three visits to Pulkovo.

Further reading: *Five Billion Vodka Bottles to the Moon: Tales of a Soviet Scientist*, Iosif Shklovsky, W.W. Norton, 1991.

Wind, Sand and Wars. Hired by *Life* in 1936, photojournalist John Phillips worked for the magazine for 13 years. His photographs are in the permanent collections of nine international museums.

Further reading: *Poet and Pilot Antoine de Saint-Exupéry*, J. Phillips, Scalo, 1994.

Spratt, Schmittle, and Freewing. Ed Regis is the author of *Great Mambo Chicken and the Transhuman Condition* (Addison-Wesley, 1990). His book *Nano! Remaking the World Molecule by Molecule*, will be published this spring by Little, Brown.

Personal Effects. Frank Kuznik contributes often to *Air & Space/Smithsonian*; he wrote "We'd Rather Be Solar Sailing" for the June/July 1994 issue.

Orion the Hunter. If freelance writer Carl Hoffman didn't like airplanes, he'd be in big trouble: he lives directly below the flight path of Washington, D.C.'s National Airport.

Further reading: *Sub Busters: Countering the Submarine Threat*, Hans Halberstadt, Osprey Aerospace, 1991.

"Tovarich!" Brian Duff directed public affairs activities for NASA's Manned Space Center (now Johnson Space Center) in Houston during the Apollo era. He wrote "The Great Lunar Quarantine" (Feb./Mar. 1994).

Further reading: *The Partnership: A History of the Apollo-Soyuz Test Project*, Edward Clinton Ezell and Linda Neuman Ezell, NASA, 1978.

Historic Hooterville. John Robinson is a private pilot and father of twins living in Fletcher, North Carolina.

CALENDAR

Through December 11

"Constance Stuart Larrabee: World War II Photo Journal." Smithsonian Traveling Exhibition. Brigham City Museum-Gallery, Brigham City, UT, (801) 723-6769.

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January 7–March 20

"Constance Stuart Larrabee: World War II Photo Journal." Smithsonian Traveling

Exhibition. Clark County Heritage Museum, Henderson, NV, (702) 455-7955.

January 15

"Open Cockpit Sunday." New England Air Museum, Bradley International Airport, Windsor Locks, CT, (203) 623-3305.



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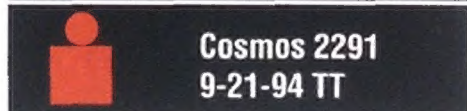
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21,750 to 22,370 MILES



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Cosmos 2283
down 9-29-94

Soyuz TM-18
down 7-9-94

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90 to 300 MILES

FSW-2(2) PRChina 7-3-94 down 7-18-94
photo recon

STS-64 U.S. 9-9-94 down 9-20-94
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STS-68 U.S. 9-30-94 down 10-11-94
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Inoperative but still in orbit

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FORECAST

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Buzzing My Old School. There's more than one way to get out of facing former classmates at your high school reunion.

Nightmare on Main Street. It used to be like any other small, scruffy southwestern ranchland town with a military base nearby, until an incident in

1947 acquainted UFO chasers all over the world with the name Roswell. On the town's Main Street, its story is told in the International UFO Museum and Research Center.

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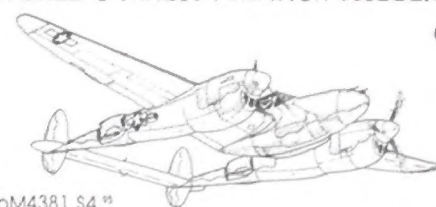
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JOHN HEINTZ

Historic Hooterville

It's a heavy mid-summer afternoon at the Western North Carolina Air Museum in Hendersonville, and a group of members and visitors are lounging outside on lawn chairs and swapping flying stories. Thunder rumbles in the distance, and now and then the talking stops and all heads turn to watch a Cessna bang a touch-and-go at the adjacent airfield. Museum co-founder Ken Stubbs walks by, and when he spots the group he calls out: "Y'all don't know anybody that needs any little kitty cats, do ya? I got two that's taken up in my hangar. If you hear of anybody wanting any, you let me know."

Inside the small steel museum building, a young visitor in diapers drops pebbles into the skim of oil collecting under a 1943 Stinson Reliant. Across the room, Al Gramlich, a retiree from New Jersey, guides a group of kids around one of the museum's two Stearmans. "This was the warhorse trainer of World War II," he explains. "As soon as the guy got off the bus they strapped him in to see what the world looked like upside down."

The Western North Carolina Air Museum is a hometown affair, fitting in comfortably with its rural locale. "When I'm trying to explain to people what a small town Hendersonville is," says Ken Stubbs, "I call it Hooterville." With its moderate year-round climate and dramatic mountain scenery, the region is especially popular with retirees and vacationers.

The museum is owned, funded, and operated exclusively by volunteers, a blend of young and old that includes folks who participated in the golden age of aviation, as well as weekend fliers who live or vacation in the area. They share all the tasks of developing and maintaining the facilities. In a recent newsletter, one help-wanted ad asked for "person or persons to do cutouts of large (24 inch) letters for the museum sign to go over the main hangar doors.... Could be done by several people and done at home or wherever. Contact Dennis."

The members also share the flier's love

of trading stories. Sitting outside the building, museum president Jim Granere regales his small audience with a tale about taking off into fickle winds: "I didn't know if I would make it till I got out over Spartanburg Highway," he says, shaking his head. "I'll not do that again in the

*Western North Carolina Air Museum,
1340 Gilbert St. (by mail: PO Box 2343),
Hendersonville, NC 28793. Phone (704)
696-9151. Open weekends and Wed., noon
to 5 p.m., Dec. to Feb.; Sat., 10 a.m. to 6
p.m., and Sun. and Wed., noon to 6 p.m.,
Mar. to Nov. Admission free.*

Grasshopper with somebody in it." The museum's collection, spanning American aviation from about 1930 to 1950, often inspires this kind of storytelling, especially with the area's older residents. "Lots of people come in, point at an airplane, and say, 'I used to fly one of those forty years ago,'" a museum member observes. "They want the satisfaction of remembering."

Among the evocative artifacts, some parked wing to wing, some hanging from the ceiling, are a Heath Parasol, a Taylor E-2, a Piper J-2 and J-3, and a 1952 Ercoupe. On one side of the wide doorway is the 1942 Aeronca L-3 Grasshopper that gave Granere such a hard time. It occupies the spot that used to belong to a Fairchild PT-19. That two-seat trainer was totaled when it went down on final approach during a museum fundraiser. Outside, an SNJ-5 Texan awaits restoration. "The donor wants to fund a total rebuild to Oshkosh quality," says Granere. "He'd be looking at spending maybe \$50,000 on it without too much trouble."

It's a modest collection; "Some people come in and take a tour and in five minutes they're gone," says Granere. George Bush belonged to this group. In town during the 1992 presidential campaign, he was scheduled to helicopter out of Hendersonville airport. "A few days

before the visit," Granere recounts, "the Secret Service guys were putting in their phone lines, and we just happened to be standing out there and said, 'You know, we've got a Stearman, just like the plane Bush flew when he first started flying.' One thing led to another and they sandwiched in a five-minute visit. He got out of his car, ran over to the airplane, shook your hand, and said, 'Boy, it's a nice airplane. Okay, bye.'"

For those who can spend the time, the museum has more to offer than its collection of exhibits. Once or twice a year, it holds an Air Fair at the airfield, drawing several thousand visitors.

Vendors set up along the runways, selling hot dogs, toy airplanes, and T-shirts. This spring, one table sold rides in one of the museum's Stearmans with photocopied leaflets that recalled the barnstorming days: "See Your House from the Air!" Another had a sign reading "AEROBATIC Thrill Rides. Loops & Rolls and Other Stuff." The atmosphere was that of the flying circuses that used to visit airports like this one.

Still, the museum members are aware that the younger generation is interested in a different aviation culture. Granere recalls an airshow the museum sponsored at the nearby Asheville airport last year that illustrated the difference. "We had a B-17, P-51, PBY Catalina," he says, "but one F-16 making a low pass across the field is what drew the crowd. Everybody under 40 was over here at the F-16; everybody over 50 was over there at the B-17. The interest is gone in the other. So preservation of what little interest is left is important."

Bud Kemper, a retiree from the Sikorsky helicopter company, adds: "There are not many small airports where you can just come and look around and shoot the breeze." The Western North Carolina Air Museum makes Hendersonville's airfield one of them, and in a way the museum itself has become its own exhibit: "Small Town Airport, circa 1948."

—John Robinson

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